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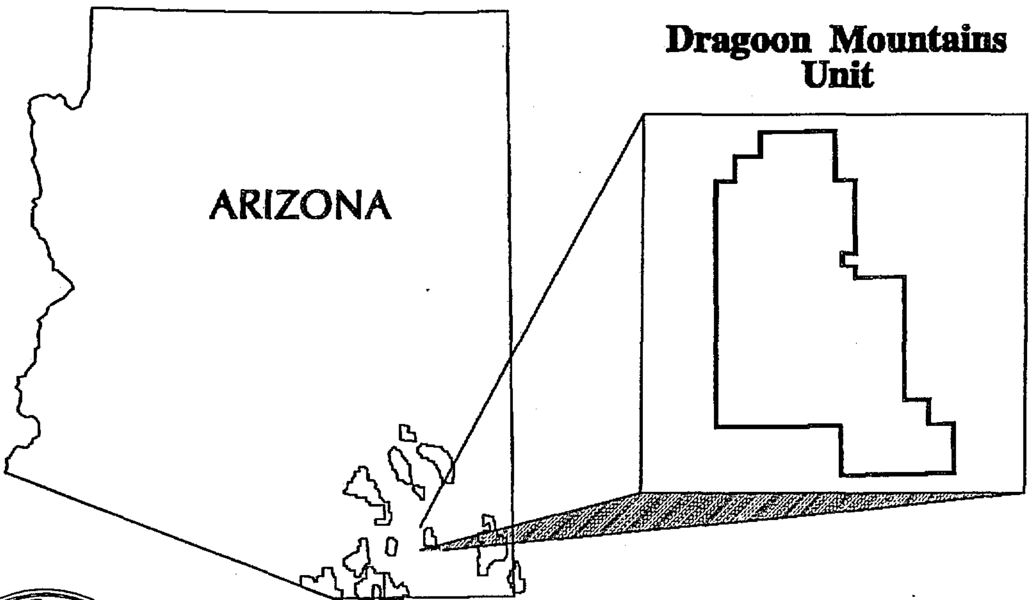
MINERAL APPRAISAL OF CORONADO NATIONAL FOREST, PART 6

Dragoon Mountains Unit
Cochise County, Arizona



BUREAU OF MINES
UNITED STATES DEPARTMENT OF THE INTERIOR

MINERAL APPRAISAL OF CORONADO NATIONAL FOREST, PART 6

DRAGOON MOUNTAINS UNIT
COCHISE COUNTY, ARIZONA

by

MARK L. CHATMAN
U.S. BUREAU OF MINES

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16. Abstract (Limit: 200 words)

The U.S. Bureau of Mines studied mineral resources of the Dragoon Mountains Unit, Coronado National Forest (54,264 ac), Cochise County, AZ. This study involves literature and field investigations with a focus on mine and prospect sites, which were inventoried and mapped; maps are contained in this report. Rock-chip samples were taken from mineralized zones and from some mine dumps; assays of the 477 samples are in appendixes. Mineral deposits are genetically and spatially related to Tertiary-age granitic intrusive activity. Most metallic mineral deposits are also strongly fault-controlled. Colored marble resources (270,000 st) are valued at approximately $6.5 million, if all were to be developed and sold as landscaping material in the form of marble chips. However, with current demand, it is unlikely that regional markets could absorb all this material. Economic modeling of copper-zinc-silver skarns suggests none would be profitable to mine and capitalize at early 1993 commodity prices, mainly due to the small estimated size of the deposits (30,000 st to 40,000 st maximum). In the entire Unit, 140,000 st of *inferred* subeconomic skarn resources were estimated by USBM on five different skarn trends; *measured* subeconomic resources are negligible. Exploration by industry, 1992, was small-scale (on 2 skarn trends and 1 auriferous fault zone).

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PREFACE

A January 1987 Interagency Agreement among the U.S. Bureau of Mines (USBM), U.S. Geological Survey, and the U.S. Dep. of Agriculture, Forest Service describes the purpose, authority, and program operations for forest-wide studies. The program is intended to assist the Forest Service in incorporating mineral resource data into forest plans as specified by the National Forest Management Act (1976) and Title 36, Chapter 2, Part 219, Code of Federal Regulations, and to augment the USBM's mineral resource data base so that it can analyze and make available minerals information as required by the National Materials and Minerals Policy, Research and Development Act (1980). This report is based upon available information, extensive field investigations to verify or collect additional information, and contacts with mine operators and prospectors active on lands administered by the Coronado National Forest.

This open-file report summarizes the results of a USBM forest-wide study. The report is preliminary and has not been edited or reviewed for conformity with the USBM editorial standards. This study was conducted by personnel from Intermountain Field Operations Center (IFOC), P.O. Box 25086, Building 20, Denver Federal Center, Denver, CO 80225-0086.

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UNIT OF MEASURE ABBREVIATIONS USED IN THIS REPORT

Acre(s)	ac
Inch(es)	in.
Foot (feet)	ft
Gallon(s) per day	gpd (English)
Mile(s)	mi
Million years (before present)	m.y.
Ounce(s)	oz (troy)
Part(s) per billion	ppb
Part(s) per million	ppm
Percent	%
Pound(s)	lb (avoirdupois)
Short ton(s)	st (2,000 lb)
Short tons per day	stpd (2,000 lb)

MINERAL APPRAISAL OF CORONADO NATIONAL FOREST, PART 6
DRAGOON MOUNTAINS UNIT

by Mark L. Chatman[1]

SUMMARY

The U.S. Bureau of Mines (USBM) studied the mineral resources of Coronado National Forest to appraise the resources present and determine possible mineral exploration and development targets for the future. This report addresses the Dragoon Mountains Unit of the Forest, which is 8 mi northeast of Tombstone, AZ, and comprised of 54,264 ac, all in Cochise County, AZ. This study involves literature and field investigations with a focus on mine and prospect sites, which were inventoried and mapped; maps are contained in this report. Rock-chip samples were taken from mineralized zones and from some mine dumps; assays of the 477 samples are in appendixes.

Mineral deposits in the Dragoon Mountains Unit are genetically and spatially related to Tertiary-age granitic intrusive activity. Most metallic mineral deposits are also strongly fault-controlled. Colored marble resources (270,000 st) are valued at approximately $6.5 million, if all were to be developed and sold as landscaping material in the form of marble chips. However, with current demand, it is unlikely that regional markets could absorb all this material. Less than 70,000 st have been mined. Economic modeling of calcic skarns with copper-zinc-silver sulfides suggests none would be profitable to mine and capitalize at early 1993 commodity prices, mainly due to the small estimated size of the deposits (30,000 st to 40,000 st maximum). In the entire Unit, 140,000 st of *inferred* subeconomic skarn resources were estimated by USBM on five different skarn trends; *measured* subeconomic resources are negligible.

One industry drilling project in 1992 explored the Black Diamond fault zone for gold; USBM sampling verified gold presence, but did not encounter economic concentrations. Industry may have encountered more favorable data. Data available to the USBM are not sufficient to fully characterize this gold occurrence. Another small-scale industry project in 1992 focused on two of the skarn trends in the Unit. Small-scale exploration on these skarns has taken place intermittently for decades and will likely continue, although USBM estimates are that deposits larger than those mined historically must be delineated for mining to ensue.

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INTRODUCTION

The U.S. Bureau of Mines (USBM) effort in the Dragoon Mountains Unit of Coronado National Forest is one part of a comprehensive investigation to inventory, map and sample mines and prospects in the Forest, in order to assess mineral resources. Geologic and economic modeling was completed for certain sites with identified, speculative, and hypothetical mineral resources. Results of the economic modeling can be used to help predict where mineral exploration would most likely occur in the Dragoons in the future, and predict the scale of that mineral development. This report addresses economic characteristics of the major mines and prospected areas in the Dragoon Mountains Unit. Supporting and background data, including sample descriptions, assay data, mine descriptions and histories, production figures, and possible mine hazards are compiled in appendixes A-D. Within appendixes, data are ordered by sample numbers, which carry a "DR" prefix. Mine maps have been prepared for many sites; those figures and photographs from some of the marble deposits follow the references section of this report. Inset maps, enlarged sections of topographic maps which display locations for concentrated mine workings, are also in the group of figures which follow the references section. Plate 1 (in pocket) can be used as a quick reference for the relative locations of inset maps, mine maps, and samples.

Geographic setting

The Dragoon Mountains Unit, Cochise County, AZ, is about 8 mi northeast of Tombstone, AZ. The Unit comprises 54,264 acres (fig. 1), or roughly the northern 90% of the Dragoon Mountains. Within that acreage are 1,907 ac of private land, mostly in the form of homesteads and mineral patents. The southernmost 2 mi of narrow ridge line in the range are private and state-held land. Locations of main roads, public land survey lines, nearby towns, and major geographic features are on pl. 1. There are many good roads through the range, and a railroad within 1 mi. of the northern boundary of the Unit. The rugged mountains have a colorful history. Part of the Apache Indian homeland, the Dragoons hold the concealed grave site of the Apache leader, Cochise, who died there during a confrontation with U.S. troops. The granite peaks in the east-central part of the Dragoon Mountains Unit are called Cochise Stronghold, in commemoration of the events.

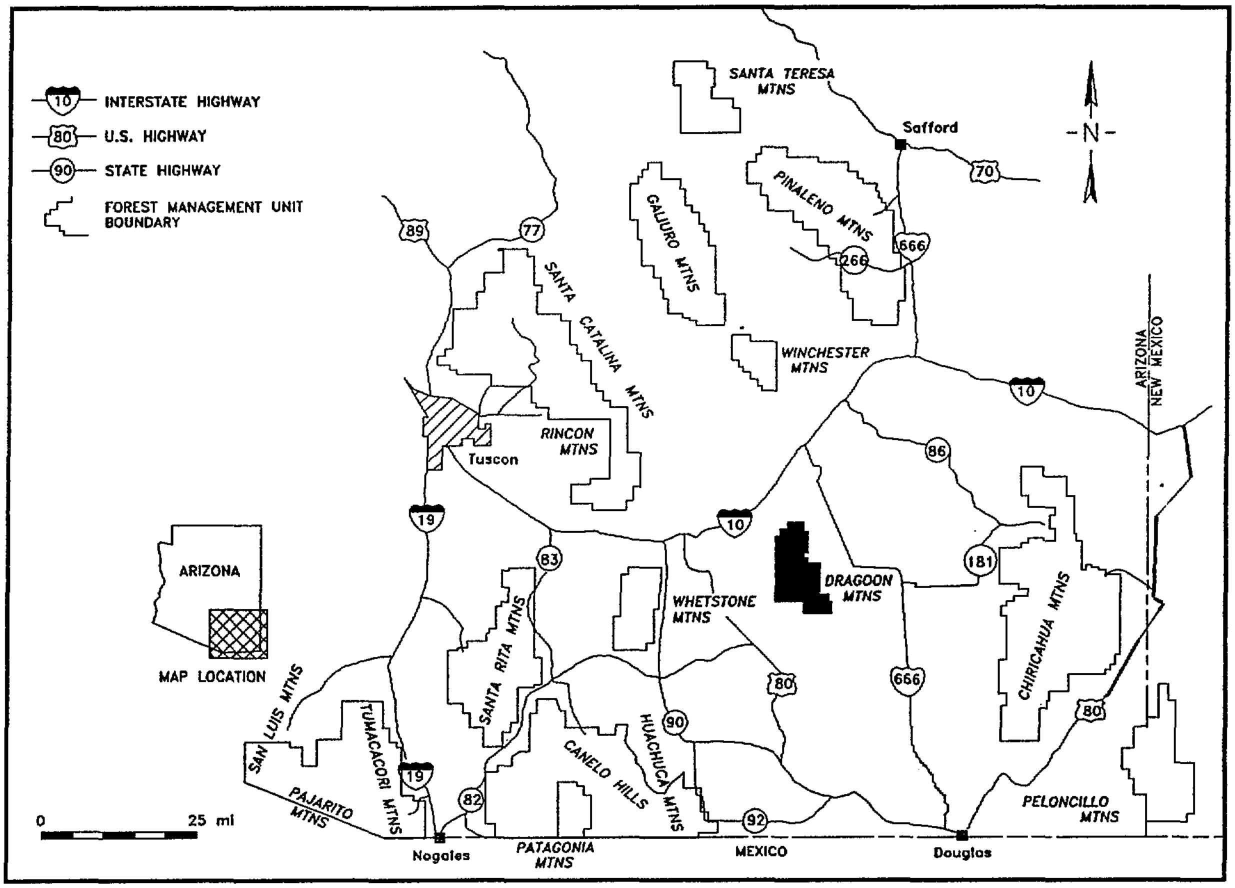

Figure 1.—Location map of the Dragoon Mountains Unit, Cochise County, Arizona.

Geologic setting

Geology of the Dragoon Mountains is characterized by Paleozoic and Cretaceous sedimentary rocks, including many carbonate units, that were folded and intensely faulted during Cretaceous time, and then engulfed by the granitic Stronghold batholith during the Oligocene epoch. In addition, some Precambrian-age metamorphic and plutonic rocks were engulfed during this plutonic event. Intrusion by the Stronghold batholith took place remarkably late, relative to the majority of intrusive igneous events of the Cordilleran orogenic belt. Mineralizing processes, induced by the batholith, followed the Cretaceous-age fracturing in the sedimentary rocks, forming mineral deposits; fracturing was dominantly on northwesterly trends. One of the more dominant of these northwesterly fractures is the Black Diamond fault zone, which hosts some mineral deposit loci.

Oldest rocks in the Dragoon Mountains Unit are Precambrian-age Pinal Schist, followed by a 1,450- to 1,650-m.y.-old (Precambrian-age) granitic intrusion, and lower Paleozoic sedimentary rocks[2]. Those rocks are overlain by the Naco Group[3], which was deposited across the Pennsylvanian and Permian time boundary. Oldest Cretaceous-age strata include Glance Conglomerate[4], which is basal rock unit of the Bisbee Group, overlain by 2,700 ft of upper Bisbee Group rocks (shale and siltstone, with some sand and lime interbeds). Stratigraphic work by Kerr-McGee Corp. (USDA Forest Service files, Douglas, AZ, 1974), delineates Triassic- to Jurassic-age Cochise Peak quartz monzonite porphyry along the western ridge line of Middlemarch Canyon, but later work (Drewes and Meyer, 1983, map) classed these same rocks in the Precambrian.

Several igneous events occurred during Tertiary time. Tertiary-age igneous rocks known to be present in the Dragoon Mountains include a 52-m.y.-old granitic stock, which has been found only along the northwestern edge of the mountain range. The Stronghold batholith, of granitic composition, is the dominant rock unit and major intrusive event in the geologic history of the Dragoons. The batholith is 22 to 27 m.y. old, and is enigmatic relative to other Cordilleran orogenic intrusive rocks in the region,

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[2] A 2,300-ft-thick section that includes Cambrian Bolsa Quartzite, Cambrian Abrigo Formation (shale, quartzite, and limestone), Devonian Martin Formation (limestone, dolomite and sandstone), and Mississippian Escabrosa Limestone.

[3] A 3,500-ft-thick section that includes Scherrer Formation (quartzitic sandstone), Epitaph Dolomite, Colina Limestone, Earp Formation (limestone and siltstone), and Horquilla Limestone.

[4] As much as a few thousand ft may be present.

for its large size, its young age, and its content of fluorite. The batholith crops out in the center third of the Dragoon Mountains, and underlies most, if not all, of the range.

Youngest igneous rocks in the Dragoon Mountains are Tertiary in age, and are composed of numerous, often fine-grained rhyolite dikes, including some of devitrified glass, and others of aplitic composition. Small, Tertiary-age, quartz-potassium feldspar stocks at the northeasternmost end of the Dragoons are the apparent source of gold mineralization in the Golden Rule district.

The youngest sedimentary rocks in the Dragoon range are indurated Quaternary sediments and caliche-cemented colluvium along drainages. Most stratigraphic, structural, and geochronologic information in this geologic setting was derived from Drewes and Meyer (1983, map).

Mining history

History concerning most individual mine or prospect sites in the Dragoon Mountains Unit is presented in detail in appendix D. The sites are ordered by sample number. Plate 1 affords a quick guide to the sample number locations. A synopsis of the Dragoon range mining history follows. The Dragoons first received the interest of miners during the 1870's silver rush that focused on Tombstone, AZ (Kreidler, 1981, p. 1). Silver production from the range, however, has been as a byproduct from zinc and copper skarn development, which has taken place sporadically from the 1890's to the 1960's. Copper mining essentially ended in the 1920's; zinc mining started about that time, and continued until Government price supports on zinc were ended in the 1950's. Some prospecting for zinc and copper skarns has occurred nearly every year since mining ended, including 1992. Total production was concentrated at five mines. The three main copper mines, Black Diamond Mine, Middlemarch Mine, and Cobre Loma Mine, produced about 1.6 million lb copper and 29,000 oz silver; 72% of the copper came from the Black Diamond Mine. Zinc came mostly from the Abril and San Juan Mines, with a combined production of 10.9 million lb zinc. About 73% of this total came from the Abril Mine, which also contributed about 0.4 million lb copper. Combined tonnage of ores from these five mines was about 80,000 short tons (st). No single deposit in the range exceeds 40,000 st-size (reserves plus resources). No other skarn-hosted base metal/silver property in the Dragoons produced as much as 400 st of ores. Gold is present in the skarns in amounts far below economic levels, though small amounts have been recovered from the base metals.

In 1992, Manhattan Minerals Corp. exploration drilling for gold was centered on patented land overlying the Black Diamond fault zone. Results of this drilling are proprietary. Two large placer patents on the east slope of Mt. Glenn may have been staked for gold, but no access privileges were obtained from the owners, so no evaluation was done there. Gold exploration in the Golden Rule district, which is outside the National Forest, ended a few hundred feet north of the Dragoon Mountains Unit. Efforts to find economic lead deposits and tungsten deposits in the Dragoons historically were not successful.

Marble was quarried along the north edge of the Dragoon range, mostly from the early 1950's to about the mid-1960's. Quarrying since has been sporadic and production has been very small. In total, about 69,000 st were quarried, and most was processed into marble chips for terrazzo and roofing granules; about 2,000 st of the production was dimension marble. Limestone and/or dolomite was quarried at three sites, though only about 2,000 st were produced. The use of that rock is not known.

Previous investigations

The most comprehensive work to date was the RARE II (Roadless Area) study done during the late 1970's and early 1980's by USBM and U.S. Geological Survey personnel under authority of the Wilderness Act (Public Law 88-577). Only 32,820 ac were studied, as lands with significant established mining or prospecting, and established roads were not included within the Dragoon Mountains RARE II area. Several publications resulted from the RARE II study, including an appraisal of some mines and prospects (Kreidler, 1981, 1984), geologic mapping (Drewes and Meyer, 1983), an assessment of the mineral resource potential (Drewes and others, 1983), and geochemical studies (Drewes, 1984; Watts and others, 1984). A background on the tectonics that affect the Dragoon range can be gleaned from Lipman and Hagstrum (1992), Krantz (1989), Keith and Barrett (1976), and Cederstrom (1946b). Cederstrom (1946a) investigated stratigraphy and geologic history of the Dragoons, and Rushing (1978) studied contact metamorphism in part of the range. There are numerous unpublished theses and mine reports that concern individual mines in the Dragoon Mountains; the reports are cited at appropriate places in text, tables, figures, and appendixes throughout this report.

Present investigation

This USBM mineral appraisal of the Dragoon Mountains Unit was carried out intermittently over several years by various personnel. Work was undertaken in

August, November, and December of 1989, the late spring of 1991, and early September 1991; much of the work was done in June and early July 1992. This study involved comprehensive literature search and field investigations, which focused on mine and prospect localities. An inventory of mines and prospects was compiled for the Dragoon Mountains Unit and field locations were verified. A total of 477 rock-chip samples was collected from the mines and prospects, and from related mineralized structures, to augment an appraisal of the mineral resources. Sample descriptions are in appendix A. Samples (excluding 21 marble samples) were analyzed for two different suites of elements, one by Bondar-Clegg and Co., Ltd. (results in appendix B), and another by Chemex Labs, Inc. (results in appendix C). Detection limits and analytical methods are listed in the respective appendixes. Maps made at many of the mine and prospect sites are included with this report, following the references section. In some cases, old mine surveys were used as a map base, and the bases updated to show more recent excavations. Extensive background and supporting data, which concern the mines and prospects and are not included in the body of this report, are in appendix D. Economic modeling using the USBM PREVAL program was applied at several sites where mineral resources [usually in the inferred or speculative resources categories (U.S. Bureau of Mines and U.S. Geological Survey, 1980, p. 1-5)] are thought to be present. Marble and limestone resources were evaluated after surveying local market conditions, and merging those data with field measurements, and information in literature from earlier assessments.

MINERAL DEPOSIT APPRAISAL

Mine and prospect sites that are appraised in this section are depicted on detailed topographic inset maps and/or mine maps. Plate 1 (in pocket) shows topographic inset locations and locations of isolated mines and prospects. Individual maps are presented as figures, following the references section. Supporting data for the economic conclusions reached concerning individual mine and prospect sites are in appendixes A, B, C, and D, which contain sample descriptions, two suites of sample assays, and detailed mine data, respectively.

Modeling

This appraisal employs mine modeling and costing to estimate economic viability of re-opening existing mines, developing existing prospects, and exploring further at sites for which data suggest mineral deposits in the indicated, inferred, speculative or hypothetical resource categories may be present.

Geologic models

Geologic modeling was applied to very few of the stone deposits (marble, limestone) in the Dragoon Mountains Unit. Previously derived tonnage estimates, based on field work by G. W. Bain (1963, 1964a, 1964b) at some marble areas are applied extensively in this USBM evaluation. For calcic skarn deposits of base-metal sulfides, various data were available in limited amounts to develop geologic models for individual deposits. These data include limited drill data (often summarized in the literature source), outcrop skarn exposures, skarn exposures in mines, Coronado project rock sample assays, and assays and structural data from literature. Persistent fault trends in carbonate rocks were the preferred permeability zones for skarn formation. Thus, most skarns were modeled as planar deposits. Strike lengths of these planar deposits are 2,000 ft at the maximum, but are commonly 500 ft or less. Depths (down-dip extension) are commonly 100 ft to 200 ft and about 400 ft maximum. Widths are commonly 5 ft to 20 ft. A few of the skarns, for which geologic evidence is available, are modeled as pipe-like deposits.

Economic models

Economic modeling is based on PREVAL, the USBM prefeasibility mineral property evaluation software program designed for general economic valuation of properties about which very limited details are known. Results can be considered as a screening to help rank sparsely quantified mineral exploration targets, but costs should not be used as definitive numbers (Smith, 1992, p. 1, 2). Basic PREVAL parameters are discussed in appendix E. Minor modifications made to the PREVAL parameters, made just for this study of Dragoon Mountains Unit properties, are enumerated in the following section.

Methodology modification, Dragoon Mountains Unit properties

Dragoon range properties that have been characterized through PREVAL software are mostly of too low tonnage to be feasible to mine. Most could be mined out in a year or less at just 100 st/day mine production rate. In numerous instances, the sum of operating, transportation, and smelter/refinery costs far exceed the contained metal value in the concentrate hypothetically producible from the recoverable tonnage. In such cases, NPV (*net present value*, see appendix E for definition) was not considered meaningful. Further, it is obvious that few or no capital costs could be recovered if an entire deposit were to be mined and processed. For such cases, the "loss or profit" column in table 2 was derived. Values in that column were derived by determining the contained metal value in mill concentrate that could be made from the PREVAL-calculated recoverable part of the deposit. Then, subtracted from this contained metal value are mine and mill operating costs, and the concentrate transportation and smelter/refinery costs. All resultant values (losses) are expressed in terms of *\$ per st of ore mined*. This loss per st of ore mined reflects the estimated relative unprofitable nature of these mineral properties, considering just the revenue that hypothetically could be realized from mining, less the basic operating costs (mine, mill, transportation, smelter/refinery). The complete valuation of such properties (NPV) would be considerably less than indicated by the "loss or profit/st of ore mined" column in table 2, because of further value reduction via mine and mill capital costs that cannot be recouped and because of NPV components of royalties, depreciation, amortization, and some types of taxes.

Mineral occurrence types

Mineral occurrence types in the Dragoon Mountains Unit can be divided into two main categories: stone, and sulfidized, metalliferous, calcic skarns. Gold (form unknown) possibilities in the Black Diamond fault zone and nearby fractures are addressed, but data are very limited, and little analysis could be done. Also discussed is a tungsten occurrence, for which there is little data, and even less economically favorable data.

Stone occurrences consist of marble and limestone. The Stronghold batholith and possibly the older stock (which underlies only the northwestern edge of the Dragoon range), metamorphosed carbonates to form marble deposits. Some of the marble deposits were quarried in past years, but the limestone is essentially undeveloped.

Fractures were the preferred permeability zones for calcic skarn emplacement in the Dragoon range. Loci of skarns are nearly all along or in splays of the northwest-trending fault zones that cut Paleozoic and Mesozoic strata. The Stronghold batholith is the source of most metal-bearing, mineralizing fluids that formed mineral deposits in the range. Most of the mineral deposits are sulfide-metal calcic skarns, with some combination of copper, zinc, and silver.

Stone

Marble

The USBM objective was to determine what and how much was produced from marble quarries on the Forest. No detailed mapping of beds was done, except at the Breche Saguaro quarry (DR18-19). G. W. Bain's (1963, 1964b) work was relied on for *resource* tonnage estimates at the other sites, because he had done some detailed tracing of the marble beds outward from quarry sites. The USBM did not duplicate his work. However, Bain did not include any of his maps in his reports, so those data are lost.

Production

Marble has been quarried at eight sites along the north front of the Dragoon range, within the National Forest (figs. 2-7). The work was done mostly from the mid-1950's to early 1960's by Ligier-Arizona Marble Quarries, Inc. and the successor, Dragoon Marble Quarries. Production since has been sporadic and of very low tonnage. Total production primarily has been crushed marble chips for terrazzo construction, and as roofing granules (white marble chips spread on flat roofs in desert environments for decreasing heat absorption). Based on pit dimensions, and a tonnage factor of 12 ft^3/st, about 67,000 st of chip marble was removed from the eight quarries, which include sites DR16-17 and DR21-26 (see figs. 2, 3), and the un-sampled site immediately northwest of DR27-28 (fig. 4); also sites DR31-33, DR35, DR39, DR40-43, DR44-50 (figs. 5-7).

About 2,000 st of dimension marble was quarried at two sites: the Breche Saguaro quarry (DR18-19, fig. 2), and one of the Apache Yellow quarries (DR34, fig. 6). The estimated dimension marble production is also based on pit dimensions. Dimension stone extraction was probably done in the early 1950's. Marketing of the product was never developed to any great degree. The crushed-marble-chip markets were developed instead, being more expedient for small producers. Extensive data on these sites are in appendix D, listed by sample number.

Marble resources and applications

Resources of marble remain at several of the quarries and on adjacent National Forest lands, based on estimates by USBM at site DR18-19, and earlier detailed work by Bain (1963, 1964b) at the other sites. The resource quantities and categories are listed in table 1, below. Definitions of resource categories used by USBM are in U.S. Bureau of Mines and U.S. Geological Survey (1980).

The marble resources are most amenable to production of crushed marble chips, which in today's (1993) southwestern markets would be used mainly in landscaping, as a ground cover. This kind of product is used extensively in the southwest as an alternative to lawns. Color variety, and the tendency to break into uniform chip sizes are the necessary qualities for this application. Breakage characteristics have been proven during past production. Several colored marbles are available among the resources in the Dragoon Mountains Unit: yellow-sienna, red-pink, and green (figs. 8, 9, 10). Landscaping boulders is another possible application of the colored marble. Colored marble resources total about 270,000 st (table 1). Other colored marble resources suitable for landscaping applications may exist at other sites, but were not quantified due to: 1) presence of impurities (such as shale); 2) uncertainty of color continuity at depth (some colors, such as the yellow-sienna, may be a result of weathering, and may not exist where rock has been buried); and 3) lack of data on the site.

Significantly higher tonnages of white marble resources, also suitable for marble chips, exist in the Dragoon Mountains Unit. Three white-chip quarries (DR39-50) contain 2.4 million st of marble resources. However, white marble chips are not popular in the region as crushed landscaping rock. The "earth-tones" are most popular for that end use. The white rock would therefore more likely be used as roofing granules, which is a low-end priced commodity. Characteristics of a very pure, "high brightness" white marble (a high-end priced commodity) were not observed at the white marble quarries. The marble observed in the existing quarries has significant amounts of gray coloration.

Utilization of both the white and colored marbles for terrazzo construction has been proven through past production for that use. The absence of terrazzo producers in the region suggests that terrazzo has lost popularity from the 1950's and 1960's, the time when the marble was quarried in the Dragoon Mountains Unit for that use. It is important to remember that the value of stone resources can rise or fall sharply, as consumer tastes change.

The dimension stone application of the colored marbles in the Dragoon Mountains Unit was not studied in detail. Bain's (1963, p. 4) reporting of small, detrimental fractures in much of the marble, called "glass seams", is not a favorable characteristic. Bedding thickness of most of the marble is also inadequate. It is usually less than 6-ft across, a thinness which eliminates the marble as potential dimension stone because it reduces the potential size of the dimension blocks. The Apache Yellow dimension stone site (DR34, fig. 5, 6) must be checked in the subsurface to verify its continuity of color, which may change below the weathering

Table 1.--Marble resources in the Dragoon Mountains Unit.

Site name/ sample nos.	Resource (st)	Color	Resource class	Possible uses	Mine map/ photo	Info. source
Breche Saguaro DR18-19	22,000	Varied: Brown, white, yellow, gray	Indicated	Landscape chip, landscape boulder, dimension stone	Fig. 2 (map); fig. 11, 12 (photos)	USBM field measurements, 1991
Green Chip/ DR31-33	46,500 (indic.), and 150,000 (inferred)	Green and white mixture	Indicated and inferred	Landscape chip	Fig. 5, 6 (maps); fig. 10 (photo)	Tonnage from Bain (1964b, p. 2)
White quarries/ DR39 and DR40-43	180,000	White	Indicated	Roofing granules	Fig. 5, 7 (map); fig. 13 (photo)	Tonnage from Bain (1963, p. 32)
White quarries/ DR44-50	950,000	White	Indicated	Roofing granules	Fig. 5, 7 (map)	Tonnage from Bain (1963, p. 32)
Paul claim (not mined) south of DR44-50 in T. 17 S., R 23 E., sec. 4; no sample	1,300,000	White	Indicated	Roofing granules	Fig 5 (map) and pl. 1 for approximate location	Tonnage from Bain (1963, p. 32)
Red Marble Quarry/DR21-26	7,000	Red and pink	Indicated	Landscaping chips, landscaping boulders	Fig. 2, 5 (maps); fig. 9 (photo)	Tonnage from Bain (1963, p. 32)
Unnamed quarry immediately N. of DR27-28	11,000	Red and pink	Indicated	Landscaping chips, landscaping boulders	Fig. 2, 4 (maps)	Tonnage from Bain (1963, p. 32)
Unmined area E. of Red Marble Quarry in T. 16 S., R. 23 E., sec. 26, both the NW. 1/4 and the SW. 1/4.	30,000	Red and pink	Indicated	Landscaping chips, landscaping boulders	Fig. 5 (map) and pl. 1 for approximate location; not mapped	Tonnage from Bain (1963, p. 32)
Unmined area S. of Red Marble Quarry in T. 16 S., R. 23 E., sec. 27, NW. 1/4, SE. 1/4	4,000	Red and pink	Indicated	Landscaping chips, landscaping boulders	Fig. 5 (map) and pl. 1 for approximate location; not mapped	Tonnage from Bain (1963, p. 32).

horizon. The Breche Saguaro dimension stone quarry (DR18-19, fig. 2, 11, 12) could be pursued for more dimension blocks, but some parts of the complex marble-cobble matrix reportedly do not take a polish. The site could readily be quarried for landscaping boulders or landscaping chip marble. About 90 st of already broken rock that could be used as landscaping boulders are currently (1991) on the quarry floor.

Economics.--It may be possible to quarry the colored marbles profitably, provided that markets are developed for the chip-marble products. There is little colored marble production in the region, and a market niche may be found for the colored landscaping materials. There are, however, several competing rock products in this field. Test marketing therefore would be an essential part of a complete appraisal of these deposits.

Marble landscaping chips could be quarried and processed for about $2.30/st (Rock Products, 1991, p. 31). Transportation, the other major cost, would be about $1.50/mi in 20 st loads. Rail transportation could be economical because rail lines are no more than 2.5 mi from any of the quarries; expected costs are about $0.047/st-mi, or about $3.30 to bulk-ship 1 st from the quarries to Tucson, AZ (Western Mine Engineering, Inc., 1993). The colored marble chip products sell for $32 to $40/st in the region. Quarrying the colored marbles for landscaping *boulders* would realize lower costs and higher revenues that the quarrying of marble chips. Landscaping boulder production costs would be about 40% less than those of marble chips, due to the absence of processing needs. The landscaping boulders could be quarried for approximately $1.40/st. Potential revenues are considerably higher than revenues for marble chips: about $85/st.

The total amount of colored marble resources in the Dragoon Mountains Unit (270,000 st) represents an approximate net value of $6.5 million. This valuation is based on the following parameters: 1) all the rock is sold as $40/st landscaping chip material; 2) losses at the quarry sites will be significant due to fracturing in the rock formations, impurities, color variations, and mining losses from slope and overburden problems (30% losses estimated from these factors); 3) the recoverable marble resource is reduced to 190,000 st to reflect losses listed above; and 4) mining, processing and shipping costs will average $5.60/st, or 14% of gross revenues from sales. It should be noted, however, that the region may *not* be able to consume that much landscaping marble product. Total production of chip marble from these sites over the past 40 years has been about 25% of the total existing resources. At the same production rate, the resources represent nearly two centuries worth of supply.

It is unlikely that the large tonnage of white chip marble on the Forest will be developed further. The material would most likely be used as roofing granules, which sell for about $21/st. The limited overall tonnage demand for roofing granules, compared to landscaping materials, limits the production from any potential quarry operation. Further, there is significant competition already in place, and much closer to the closest large market in the region, Tucson, AZ. Established competition includes Catalina Marble, Inc., which produces crushed white marble products at Catalina, AZ, 20 mi north of Tucson, AZ, and Specialty Minerals, Inc., which quarries and produces crushed white marble for several uses, including landscaping chips, at the Santa Rita Quarry, in the Santa Rita Mountains Unit of the National Forest, about 30 mi south of Tucson, AZ (Phillips and others, 1992, p. 11, 18).

Limestone and dolomite

The Paleozoic-age limestones and dolomites in the northern part of the Dragoon Mountains Unit are primarily in the Escabrosa Limestone formation, and also in the impure beds of the Horquilla Limestone and Earp Formation. These rocks may have several low-unit-value applications, which include crushed stone for fill (dolomite and limestone), and (limestone only) as crushed stone for aggregate, raw material for portland cement, and use as a sulfur-dioxide scrubber for stack emissions at power plants and smelters. Previous development has been very limited. Based on pit dimensions, slightly more than 2,000 st of limestone and dolomite were quarried at 6 sites in the Dragoon Mountains Unit (fig. 2, DR14, 15, 20, 27-28, 29, 30). About 1,200 st of rock was removed from the largest of the quarries (DR27-28). Use of this product is not known. The material may have been used as crushed stone fill or aggregate. Additional details on the quarries can be found in appendix D. About 1 mi^2 of National Forest land along the northern edge of the Dragoon Mountains Unit is underlain by rocks that include the carbonate rock formations (mentioned above) of interest (pl. 1). The precise amount of area actually underlain by carbonates is not known, because the individual beds have not been mapped. Therefore, no detailed quantification of the total amount of limestone and dolomite present was attempted. The total will certainly be in the millions of tons. The same carbonate rock formations (not shown) are present in other parts of the north half of the Dragoon Mountains Unit (Drewes and Meyer, 1983, map); these are not considered to be resources because they are more distant from the rail transportation available near the northern edge of the Dragoon Mountains Unit. The importance of transportation to the utilization of the rock resources will be illuminated in the following sections.

Potential crushed stone application

Further development of small quarries in the Dragoon Mountains Unit for making crushed stone products out of the limestone and dolomite units would be limited by the following economic conditions. The material could be quarried for about $2.30/st (Rock Products, 1991, p. 31) and shipped in bulk by rail to the largest market in the immediate region (Tucson, AZ) for about $3.30/st (Western Mine Engineering, Inc., 1993). On the average, crushed stone products in the U.S. sold for approximately $4.80/st in 1992 (U.S. Bureau of Mines, 1992, p. 164), the most recent year for which data are compiled. This leaves a potential margin of net revenues of just $0.20/st, a situation that likely would preclude any development of the sites in the immediate future. The transportation-to-market cost is the most obvious factor that makes these quarries subeconomic. Further, markets must be developed for the crushed stone products prior to any quarry re-development. No market studies have been conducted. The rock could have an application as fill for road building; the limestone could additionally be used as crushed aggregate for concrete products, including road building.

Potential portland cement application

Paleozoic-age limestones crop out north of the National Forest boundary on State and BLM-administered lands (pl. 1) in T. 16 S., R. 23 E., sec. 14, 15, 16, 22, 23. There, these carbonate rocks have been previously evaluated for potential portland cement raw material by A. C. Haigler and some associates; a white-colored portland cement was successfully made in tests of these materials, which crop out over about 1,300 acres (Mieritz, 1958, p. 3-4). The formations of interest likely were the Escabrosa Limestone, and impure limestone beds in the Earp Formation and Horquilla Limestone. Limited analysis of samples from the southern Gunnison Hills (sec. 14, 15, 16) reveal 91.7% to 97.8% $CaCO_3$, 2.3% to 6.1% SiO_2, and 0.36% to 0.81% MgO in 5 limestone samples. Samples immediately north of the National Forest, from the same rock formations (sec. 22, 23) have comparable compositions: 92.8% to 95.6% $CaCO_3$, 2.9% to 5.4% SiO_2, and 0.20% to 0.47% MgO (Mieritz, 1958, p. 4). Precise locations of these samples were not reported in Mieritz (1958).

This very limited chemical analysis of the rocks is insufficient to fully characterize them for portland cement raw material. Carefully controlled quantities of lime (CaO), silica (SiO_2), and alumina (Al_2O_3) needed to make portland cement require a careful blending of several raw materials with crushed limestone, including a high alumina clay or shale, and sometimes a silica source (if the limestone raw material is silica deficient) (Phillips, 1992, p. 35). Impurities that must be limited in quantity are mainly magnesia (MgO) and alkalies (Na_2O and K_2O), but also sulfur (reported as SO_3) and to some extent titanium oxide (TiO_2) (ASTM, 1987, p. 159-160; Houser, 1992, p. 3). It is obvious then, that other whole-rock-type analyses would be needed to fully characterize the limestones. This expensive analysis, which runs well over $100 per sample, was not undertaken in this Coronado National Forest study. Dolomites are not used for cement manufacture, due to their inherent high magnesium content.

Economics.--The assumption is made that at least some of the limestone present in the northern part of the Dragoon Mountains Unit is useable as portland cement raw material, based on the work by A. C. Haigler (Mieritz, 1958, p. 3-4). If that assumption is correct, then the primary economic considerations become 1) the need for significant capital investments to develop the raw material; 2) the low unit value of the raw material; and 3) the condition of the cement markets in the present and future.

To develop the limestones as portland cement raw material, a cement plant would have to be built between the southern end of the Gunnison Hills and the northern end of the Dragoon Mountains range, and near the rail line (pl. 1). Transportation costs are the primary driving economic factor for this situation. To be economically operable, cement plants are built an average of no more than about 2 mi from the supplying raw materials quarry (Huhta, 1991, p. 29). That situation precludes use of other limestones that are potentially in outcrop areas of Paleozoic strata (not shown) in the north half of the Dragoon Mountains Unit. They are too far away from transportation and logical cement plant location to be considered. [See Drewes and Meyer (1983, map) for mapping of these grouped formation divisions].

Low unit value of the raw material is another economic consideration. Cement plants in the region pay an average of $2.90/st for raw material, delivered to the plant (Huhta, 1991, p. 31). Subtracting the approximate transportation charge to the plant of about $1.50 to $2.00/st, it becomes apparent that an economically competitive cement plant is paying only about $1/st for its raw materials, which would include limestone, a silica source, and an alumina source.

The local and overall economic condition of the cement industry must be considered prior to planning the major capital investment of a cement plant. Nationally, cement use declined in 1991, part of a four year trend; price also declined (Solomon, 1993, p. 2). In the short term, those are not ideal conditions for building additional cement manufacturing capacity. Further, of the 2 cement plants in Arizona (Phillips and others, 1992), the largest (with 64% of the State's total capacity) is Arizona Portland Cement Co's. Rillito Plant in Tucson, AZ, (Phillips, 1992, p. 34-35).

That existing plant is thus centered in the largest market area that could be served by a hypothetical plant near the Dragoon Mountains Unit. In the long term, environmental and population pressures may make relocation of cement manufacturing from the heart of populated Pima County, AZ to an outlying area (such as Dragoon Mountains) an economical consideration. (See general environmental and urbanization pressures described in Eyde and Eyde, 1992, p. 47). The local populace around the Arizona Portland Cement Co's plant in Tucson, AZ, has raised objections to the use of waste fuels to fire the plant's cement kiln (Bagwell, 1992, p. B-1). Use of waste fuels (such as old tires and used motor oil) is very wide-spread in the industry, and is an essential ingredient to maintaining a competitive manufacturing operation. Should it come to pass that the use of waste fuels is banned near Pima County population centers, further pressure to move manufacturing to a new location would result. Of course, if the cement plant moves, a new quarry site must be chosen also.

Other application

Another possible application of the limestone is an agent to reduce sulfur-dioxide emissions from power plants. Apparently, some unknown, small amount of previously excavated marble from one of the White marble quarries (fig. 5, DR39-50) was removed for this purpose in 1981 (USDA, Forest Service files, Douglas, AZ).

Calcic skarn deposits of base-metal sulfides

Middlemarch Canyon

Introduction

Middlemarch Canyon (fig. 14) contains several calcic skarn deposits that have been prospected or mined for copper, zinc, and silver sulfide minerals. Total production from the canyon, all prior to 1921, was 14,000 st of ore with 400,000 lb copper and 17,000 oz silver. The largest production from any one site was at the Middlemarch Mine (fig. 14, 15), where approximately 9,800 st of 1.5% Cu ore yielded about 270,000 lb copper and all of the silver. (See appendix D, p. D94 for documentation of production estimates.)

The skarns contain copper sulfides with byproduct silver, which have been mined. The zinc sulfides were never mined or recovered, but potential zinc ores remain in the ground. Gold was found in economic concentrations only as a byproduct of a short-lived mining operation, during the 1890's, that extracted the oxidized zone over one of the skarns at Middlemarch Mine. Mining of the oxidized zone accounted for most of the total silver production of Middlemarch Mine. (See appendix D, p. 94.)

Geology

Late Tertiary-age rhyolite porphyry, in dikes and probably stocks, intruded carbonate rocks and shale of the Bisbee Group and rocks lower in the Paleozoic section, forming calcic skarn at several sites. Spatial relationships, observed in the field and on geologic maps, and data in mining-era reports, suggest this rhyolite porphyry was the mineralizing agent (Snyder, 1919, p. 181; USDA, Forest Service files, Douglas, AZ, 1974). The rhyolite porphyry intrusions postdate the Stronghold batholith (Drewes and Meyer, 1983, map), and may have been formed by late-stage emanations from the Stronghold batholith as it crystallized. The Stronghold batholith was encountered in the area during Kerr-McGee drilling at a depth of 1,113 ft. The hole collar was most likely on the ridge line about 1,000 ft NW. of site DR269 (fig. 14) (USDA, Forest Service files, Douglas, AZ, 1974). The skarns occur preferentially along N. 40° W. faults, and the porphyry-sedimentary contacts are often faulted as well. (See Snyder, 1919.)

A hypothesis that the Middlemarch Mine skarn is part of a breccia pipe structure (Cameron, 1974, fig. 1) suggests the possibility of a concealed porphyry stock-type environment beneath Middlemarch Canyon, and that the skarn occurrences could therefore be the peripheral geologic expression of a much larger, and potentially much more valuable mineral deposit. Also favorable is the identification of indigenous sulfide content of the Bisbee Group carbonates (Cameron, 1974, p. 4), as that sulfide content could increase metallization tenor in a developing copper porphyry environment. However, coring to depths of over 1,700 ft, and geophysical surveying (induced polarization) failed to detect such a porphyry environment. In fact, it has been deduced that the most likely geologic condition at depth under the Middlemarch Mine (the largest and most extensively mined skarn in the canyon) is that of barren granite (Cameron, 1974, fig. 1).

Middlemarch Mine skarn trend

The skarn trends N. 30° W. to N. 50° or 60° W, from the Middlemarch Mine (fig. 14, sample area DR276-283) northwestward 1,600 ft to "the Pit" (sample area DR262-266). The skarn may continue southeast from Middlemarch Mine for another 1,550 ft (Innes and Assoc., 1982, p. 10). Skarn outcrops were described at distances of 400 ft and 1,550 ft southeast from the mine along this trend (fig. 14); these were not examined. Drilling by Toltec Resources, Ltd. suggests that, while continuity of mineralization may be possible between Middlemarch Mine and "the Pit", deposit tenor in copper, zinc, and silver increases markedly on certain loci (USDA, Forest Service files, Douglas, AZ, 1991; Mining Record, 1992, p. 1). The loci may be low-angle, cylindrical breccia pipes that bear skarn. Assessment of the Middlemarch Mine also revealed that peripheral parts of the skarns are not metallized to an economic concentration (Mahoney, 1942a, fig. 1). Regardless of genesis, the structures are likely controlled to some degree by fracturing, as evidenced by the skarns' overall northwest trend, equivalent to the pervasive fracturing direction in the canyon.

Resources.--In the Middlemarch Mine (fig. 15), two blocks of unexploited copper-zinc-silver skarn resources were never mined, based on comparison of mine reports and maps to total copper production figures. The upper block, between the 5th and 4th levels, consists of an inferred 9,000 st in a 40 ft by 60 ft cylindrical shape, dipping 45° to the northwest, and continuing down dip for 50 ft. The lower block, on the 6th level, consists of an inferred 27,000 st in a 40 ft by 60 ft cylindrical shape, continuing 65 ft down dip. Old reports indicate a shrinkage stope system was set up to draw from this block along the *8th* level.

Between the 6th and 8th levels, sphalerite-rich rock was left behind by the pre-1921 miners: a 3,800 st inferred resource in a cylindrical deposit, 15 ft by 30 ft, and extending 110 ft down dip.

The resources were downgraded from the measured category to inferred due to uncertainties and data gaps in the mining history of Middlemarch Mine (see appendix D, p. D97-99). Some of this rock could have been mined, and that fact never recorded. It was assumed that none of the rock has been mined for the purposes of this study. PREVAL analysis of the hypothetical mining of these three blocks suggests high losses will be realized, comparing operating costs to the value of a concentrate that hypothetically could be recovered; also, no capital costs could be recovered (see table 2).

The northern exposure of the Middlemarch Mine skarn trend, a prospect known as "the Pit" (fig. 14, DR264) is within a 100 ft-wide skarn zone, but samples taken across various parts of the skarn outcrop width have low metal concentrations: 18 ft of 0.14% Cu, 0.08 oz Ag/st; 21 ft of 0.26% Cu, 0.002 oz Au/st, 0.12 oz Ag/st; 9 ft of 0.06% Cu, 0.09 oz Ag/st (USDA, Forest Service files, 1975). The USBM sample collected across 35 ft of this outcrop area (DR264) verifies low metal concentrations over a large width of the skarn zone. Reported core assays identify an 11-ft-wide zone within this skarn with 0.97% Cu, 4.86% Zn, and 0.42 oz Ag/st (Mining Record, 1992, p. 1). A geologic model constructed with these data consists of an 11-ft-wide skarn,

Table 2.--Economic summary for hypothetical mining of skarns, Dragoon Mountains Unit (continues on p. 21-22)

Resource categories are defined in U.S. Bureau of Mines and U.S. Geological Survey (1980).
All costs and values derived from PREVAL software package unless otherwise noted.

Site name Sample Nos.	Tonnage Grade Commodity	Resource category	Mine capital costs	Mill capital costs	Capital reco-very[1]	Mill concentrate value[2]	Mine method, rate, life, operating cost[3]	Mill method, rate, operating cost[3]	Transporta-tion[3]	Smelter/ refinery charges[3]	Loss or profit[3]	NPV[4]
Middlemarch Mine (DR278-282) Remaining Cu-Zn resources Between 4th-5th levels On 6th level	 9,000 st, 1.7% Cu, 6% Zn, 1 oz Ag/st, 27,000 st, 1.7% Cu, 6% Zn, 1 oz Ag/st,	 Inferred Inferred	$1.1 million[5]	$1.7 million	0%	$78	Modified vertical crater retreat, 100 stpd, 1 year, $21	Flotation (2 product), 74 stpd, $58	$1 for Cu/Ag[6] conc.; $5 for Zn conc.	$7 for Cu/Ag conc.; $12 for Zn conc.	-$26	Not calcu-lated.
Middlemarch Mine Remaining Zn resources Between 6th-8th levels	3,800 st, 6% Zn, 1 oz Ag/st	Inferred	See above	See above	0%	$50	Modified vertical crater retreat, 20 stpd, 1 year, $31	Flotation, 15 stpd, $145	$9	$23	-$158	Not calcu-lated.
"The Pit" (DR264)	7,600 st, 0.97% Cu, 4.9% Zn, 0.42 oz Ag/st	Inferred	Zero[7]	Zero[7]	0%	$58	Cut-and-fill, 20 stpd, 1 year, $132	Flotation (2 product), 15 stpd, $167	$1 for Cu/Ag conc. $5 for Zn conc.	$4 for Cu/Ag conc. $11 for Zn conc.	-$260	Not calcu-lated.
Gossan outcrop 1 or Gossan outcrop 2, Middlemarch Canyon (no samples)	30,000 st 1.4% Cu, 5% Zn, 0.7 oz Ag/st	Speculative	Zero[7]	Zero[7]	0%	$67	Vertical crater retreat, 90 stpd, 1 year, $21	Flotation (2 product), 67 stpd, $62	$1 for Cu/Ag conc.; $5 for Zn conc.	$5 for Cu/Ag conc.; $12 for Zn conc.	-$39	-$3.6 million

Site name Sample Nos.	Tonnage Grade Commodity	Resource category	Mine capital costs	Mill capital costs	Capital recovery[1]	Mill concentrate value[2]	Mine method, rate, life, operating cost[3]	Mill method, rate, operating cost[3]	Transportation[3]	Smelter/ refinery charges[3]	Loss or profit[3]	NPV[4]
Cobre Loma Mine (DR246-250) Model of mining entire known deposit as if it were a newly discovered deposit.	5,000 st 1.7% Cu, 0.067% Zn, 0.43 oz Ag/st	Hypothetical	Zero[7]	Zero[7]	0%	$29	Shrinkage stope, 20 stpd, 1 year, $48	Flotation 15 stpd $145	$1	$9	-$175	Not calculated.
Lloyd and Laverne (DR251)	13,000 st, 1% Zn, 2.7 oz Ag/st	Inferred	Zero[7]	Zero[7]	0%	$16	Open cut trench, 45 stpd, 1 year, $22	Flotation, 33 stpd, $85	$1	$4	-$97	Not calculated.
San Juan (DR195-201, 205-216) Model of mining entire known deposit as if it were a newly discovered deposit.	15,000 st (= past production total). 9.7% Zn, 1.3 oz Ag/st, Pb: too low to recover.	Hypothetical	$1.5 million	$1.6 million	0%	$76	Sub-level stope, 100 stpd, 1 year, $19	Flotation, 74 stpd, $51	$18	$45	-$57	-$3.8 million
Muheim area (DR234-235 and DR236-239)	37,000 st 4.38% Zn, 4.91 oz Ag/st	Inferred	$1.5 million	$1.6 million	0%	$36	Sub-level stope, 100 stpd, 1 year, $19	Flotation, 74 stpd, $51	$3	$10	-$47	-$3.8 million
Abril Mine (DR159 area) (DR160-161 skarn) Remaining resources	1,200 st (measured), 5% Zn; 16,000 st (inferred), 11.7% Zn	Measured and inferred	Not feasible to capitalize this low tonnage deposit.	Not feasible to capitalize this low tonnage deposit.	0%	$92	Sub-level stope, 100 stpd, 1 year, $21	Flotation, 74 stpd, $49	$66	$28	-$72	Not calculated

Site name Sample Nos.	Tonnage Grade Commodity	Resource category	Mine capital costs	Mill capital costs	Capital reco-very[1]	Mill concentrate value[2]	Mine method, rate, life, operating cost[3]	Mill method, rate, operating cost[3]	Transporta-tion[3]	Smelter/ refinery charges[3]	Loss or profit[3]	NPV[4]
Abril Mine (DR156-166) Model of mining entire known deposit as if it were a newly discovered deposit.	31,000 st (= past production total) 12% Zn, 0.7% Cu, 0.35 oz Ag/st	Hypothetical	$1.5 million	$1.7 million	0%	Zn-Ag conc. worth $91; Cu conc. worth $11	Sub-level stope, 100 stpd, $19	Flotation (2 product), 74 stpd, $58	$12	$29	-$16	-$3.8 million
Black Diamond Mine, limestone-hosted deposit, NE. mine perimeter	37,000 st, 6% Cu, 10 oz Ag/st	Speculative	$1.5 million	$1.6 million	32%[8]	$119	Sub-level stope, 100 stpd, 1 year, $19	Flotation, 74 stpd, $51	$3	$18	$28	-$3.0 million
Seneca Mine (DR121-129)	31,000 st, 0.95% Cu, 2.2% Zn, 2.2 oz Ag/st	Inferred	$1.5 million	$1.7 million	0%	$63	Sub-level stope, 100 stpd, 1 year, $19	Flotation (2 product), 74 stpd, $58	$1 for Cu/Ag conc.; $2 for Zn conc.	$9	-$26	-$4 million

[1] Percent of total mine and mill capital costs, acquisition costs, and exploration costs that could be recouped by mining out the entire hypothetically recoverable deposit, compared to all estimated operating costs.
[2] Value of the flotation mill concentrates, expressed *per st of ore mined*. Value in $US.
[3] All costs expressed *per st ore mined*. Values in $US.
[4] Net Present Value.
[5] These capital costs *not* calculated by PREVAL. Infrastructure costs derived from Hoskins (1982) and Western Mine Engineering, Inc. (1987-1992), and then updated with USBM cost indices to average 1992 dollars. In the mine equipment capital costing, used equipment purchases, particularly mining and drilling machinery, was factored (at 50% of the estimated original cost). This was an attempt to reduce capital cost to the minimum, in order to test the economic viability of skarn deposits in Middlemarch Canyon. In the model *for this property only*, it was assumed that the old mine drifts and inclined shaft would be used, instead of driving new ones. If in good condition, these workings could be de-watered and refurbished for an estimated $93,000.
[6] Depletion of the remaining Middlemarch Mine pre-1921-era mill tailings in silver led to the untested conclusions that any copper concentrate produced from rock at this mine would more likely contain silver than would any zinc concentrates produced. There was no attempt to recover zinc in the mining era. The pre-1921-era milling was by flotation. Reportedly, 90% copper recovery was achieved.
[7] The model used assumes that the mine infrastructure applied to the three resource blocks in the Middlemarch Mine will be relocated and re-used for mining other resource sites in Middlemarch Canyon, and that the mill will remain at the Middlemarch Mine site throughout mining in Middlemarch Canyon.
[8] Based on estimated gross revenues of $1 million, derived by mining out the entire deposit.

with a strike length of 40 ft and down dip extent of 225 ft (length, depth based on Middlemarch Mine skarn parameters), and suggests an inferred resource tonnage of 7,600 st at the site. PREVAL analysis suggests this narrow, low tonnage skarn could not be mined profitably (see table 2). Stockpiled skarn at this site and at site DR262 total another 3,000 st.

Reported, but unexplored gossan outcrops south of the Middlemarch Mine (Innes and Assoc., 1982, p. 10) (see fig. 14) suggest additional skarn deposits along the Middlemarch Mine skarn trend. Geologic modeling of two *hypothetical* skarns for these two gossan sites, with size and grade parameters intermediate of the Middlemarch Mine skarn and the Pit skarn allow 30,000 st hypothetical deposits at each gossan site, with grades of 1.4% Cu, 0.7 oz Ag/st, and 5% zinc. Geologic and economic modeling at the gossan sites is based only on outcrop that resembles the gossan outcrop expression of the Middlemarch Mine deposit. There are no other data. PREVAL analysis of the two gossan outcrop sites, under these geologic parameters (table 2), suggests that expenditures necessary to prove the presence of such deposits and mine them could not be recouped.

Cobre Loma skarn trend

The skarn trend, which cuts shale, limestone, and granite porphyry in the upper part of Middlemarch Canyon (fig. 14), strikes N. 40° W. for at least 1,650 ft on strike, and perhaps 1,800 ft, and contains skarn of a tenor similar to that of Middlemarch Mine. The trend may be continuous between the Cobre Loma Mine (DR246-250) and the Ella prospect (DR256-257). More than one skarn is present, evidenced by skarn DR259, which parallels skarn DR256-257 (fig. 14). Total production from the Cobre Loma trend has been small: a reported 5,000+ st of siliceous, hematite-enriched, copper-bearing skarn from the Cobre Loma Mine from 1915 to 1920 (see appendix D, p. D79). Assigning an ore grade of 1.67% Cu to that production (based on Mahoney, 1942a, p. 4) allows an estimated total copper production of 150,000 lb copper. No other sites on the trend have produced ore.

Resources.--Available data for derivation of resource estimates along this trend are sparse. Geologic models applied are those of mineralized loci along the skarn trend, as in the Middlemarch skarn trend (see above), rather than continuous mineralization along the entire trend. However, the Cobre Loma trend skarns are modeled as tabular, vein-like bodies, rather than pipe-like bodies discussed at the Middlemarch Mine skarn trend. No data are available to suggest there are remaining resources in the Cobre Loma Mine (fig. 15), but nearly all of the productive zones in the mine are inaccessible.

The Ella prospect (DR256-257, fig. 14) reportedly has a high-tonnage, low grade sulfide zone of unspecified dimensions which was exposed by the 187-ft deep shaft at the site, but never mined (Innes and Assoc., 1982, p. 16, paraphrasing of a pre-1915 mine report). Outcrop of the skarn is only 5.3-ft-thick, far too narrow for mining at the encountered grades of copper, zinc, and silver (samples DR256-257). It is likely that the structure changes in dimensions at depth. The shaft was not accessed to determine this. One distinct possibility is that the zone encountered at depth is a *different* skarn, i.e. the paralleling zone (DR259) that was sampled farther to the south in outcrop. However, the outcrop sample DR259 does not contain appreciable metal concentrations.

Bill's Cut (DR252-253, fig. 14), a prospect on the Cobre Loma skarn trend, contains copper and zinc concentrations that are too low for economic consideration (appendix D). McDaniel's Cut (DR254, fig. 14) is a small splay of the trend, but without economic metallization.

Future exploration/valuation of hypothetical discoveries.--Exploration at the Ella prospect, consisting of geophysical surveying (magnetic and electrical), could resolve some of the uncertainties about the structure; adding drilling and coring from the surface would require a total exploration budget of about $35,000 to $50,000 (see appendix D, p. D83).

If another deposit of the size and grade of the Cobre Loma Mine could be delineated either at the Ella prospect through the exploration work described above or somewhere else on the skarn trend, its parameters would be a narrow (4-ft-wide) skarn, extending 200 ft on strike and 80 ft along the near-vertical dip slope, and containing 5,000 st. Grades would be 1.7% Cu, 0.43 oz Ag/st, and 0.067% Zn [grade from sample DR246, and Mahoney (1942a, p. 4)]. Zinc would not be economically recoverable at that grade. Weak wall rocks and narrow mineral zones require expensive, low tonnage shrinkage stoping methods. PREVAL analysis suggests such a deposit could not be mined profitably (table 2). Smelting costs of the copper concentrate could be higher due to a zinc penalty.

Other skarn trends

The Lloyd and Laverns prospect (DR 251, fig. 14) is a zinc skarn with an inferred tonnage of about 13,000 st, but is too low in zinc concentration for economic consideration (see table 2 and appendix D, p. D80).

Rhyolite porphyry is in the vicinity of skarn at the Cowpatch and Silverhill prospects (see fig. 14). The Cowpatch silver occurrence (geochemically anomalous silver found in outcrop) is likely silver from oxidized skarn; there are no excavations there. Innes and Assoc. (1982, fig. 7) reported 12.43 oz Ag/st and 3.82 oz Ag/st in two outcrop samples. There is no extensive gossan or skarn developed here. The Silverhill prospect is south from the Cowpatch, and could be a down-dip expression of the Cowpatch skarn. The chlorite-enriched Silverhill skarn has considerable exposed strike-length (270 ft) and averages about 15-ft-thick over that span, but contains low metal concentrations [not over 60 ppm Cu (0.006%) or 160 ppm Zn (0.016%), and no silver]. No economic modeling was considered for this low-grade rock.

Several prospects on the Sorin Gulch side of the divide (actually in Sorin Gulch rather than in Middlemarch Canyon) were examined and sampled in previous work (Kreidler, 1981). The most notable metal concentrations reported are in fractured granite near the portal of one exploration adit (DR285-295, fig. 17). Silver ranged between 3 and 4 oz/st in samples DR294-295 and D3080 (a 1980-era assay; pulp couldn't be located for re-assay in 1992). Zinc exceeds 3%, and is probably in the range of 4% to 7.6% (Kreidler, 1981, plate). Copper is below 1%. This zone of three samples is of interest because it represents a faulted, partially silicated zone that is 12-ft-thick. Lack of structural data in Kreidler (1981) prevents assessment of this zone's potential.

Middlemarch Canyon: conclusions

Geologic knowledge of the canyon to date suggest no large, low-grade deposit, such as a copper porphyry is concealed there. Future exploration is thus most likely limited to finding other small, low tonnage skarn deposits. Analysis of known skarns along the Middlemarch Mine skarn trend and the Cobre Loma skarn trend reveals that profitable mining would be difficult. The main detriment is small deposit size. The overall low tonnage drives up mining costs. Further, the narrow structures and other geologic parameters encountered at several of the deposits (the Pit, Cobre Loma Mine, Ella prospect) necessitate low-tonnage output mining methods, and result in very-low-tonnage and very-high-cost milling. The topographic setting of most deposits necessitates underground mining, which is of higher cost than surface mining. There appears to be no opportunity either to recover capital investments, even if mining the largest known or modeled deposits, or to realize a positive rate-of-return on the capital investment. Other drill data may exist that prove more favorable geologic parameters (mainly increased strike length and increased tonnage), but none were available to the USBM for this analysis.

The Ella prospect and the two unexplored gossan sites (fig. 14) could conceal higher tonnage (30,000 st) deposits. Uncertainties about the Ella site could be resolved readily by exploring the existing shaft. Surface sampling and assaying for copper, zinc, and silver anomalies around the unexplored gossan sites would be an inexpensive way to start site characterization there.

A small, self-financed mine operator possessing all necessary mine and mill infrastructure, and skilled at economically mining small (10,000 to 40,000 st) underground copper-zinc deposits may realize economic advantages not calculated by the PREVAL analysis. Middlemarch Canyon may well see continued mineral exploration in the near future around the Middlemarch Mine and Cobre Loma skarn trends, with the goal of finding wider, higher tonnage extensions of the Middlemarch skarn trend.

San Juan-Muheim skarn trend

San Juan Mine

Near-surface skarn has been mined, producing about 2.9 million lb zinc from sphalerite ores (9.7% zinc) where a 900-ft-long (Drewes and Meyer, 1983, map) vertical fracture zone cuts lower Paleozoic and Bisbee Group carbonates and other sedimentary rocks at the San Juan Mine (fig. 19, DR195-201, 205-216). (See appendix D for tonnage and grade derivations, p. D64.) The rocks are folded into a low-angle, north-trending antiform breached roughly along its long axis by north trending, vertical fractures, with bearings of N. 30° E. to N. 5° W. (Cederstrom, 1946a, p. 88). These fractures have been identified as the probable mineralization conduits to the Stronghold batholith. Minable deposits of zinc skarn resulted (Cederstrom, 1946a, p. 89). A granitic source for the zinc mineralization is at depths greater than 500 ft below the San Juan Mine (see map, Wilson, 1951, p. 22), and perhaps as much as 2,000 ft (Drewes and Meyer, 1983, map).

The deposit *within the confines* of San Juan Mine is mined out. The mined zone was small: an upper zone about 50-ft wide (NE.-SW.), 125-ft-long (NW.-SE.), and 14- to 20-ft-thick (see map, fig. 20; Sulphide and Silver adits), and a second zone, 37-ft-lower (in the Mann adit), that is about 50 ft by 60 ft in area, and of unknown thickness. Total tonnage produced was 15,000 st, with 95% of the ores mined during 1947 to 1949, and 1951. Composite grade of the ore mined from 1913 through 1947 is 9.7% Zn, allowing an extrapolated estimate of total zinc output of 2.9 million lb. The high-grade zinc was accompanied by an unknown form of erratically distributed silver (up to 8.5 oz/st in the highest-grade zinc ores), and lead (in galena) in concentrations of about 1% (Wilson, 1951, p. 21; USBM-IFOC unpub. data). No quantification of silver output is known and no lead recovery is known.

Thin skarn remaining along the stope perimeter of the mine averages 7.8 ft in thickness, and contains >2% Zn, 0.3% Pb, and 1.3 oz Ag/st (ten samples DR195, DR205-208, DR210-215). Some of these samples had been assayed at ore-grade test levels (Kreidler, 1981, pl. 1). Results demonstrate a zinc concentration range of 3.5% to 33.5% Zn. Zinc content is high in the stope perimeter; the deposit thickness there is small.

Possible deposit extension.--Drill data and geophysical surveys to confirm or negate presence of more zinc deposition *at depth* directly below the San Juan deposit are not known. Exploration at depth of the high-angle fracture conduit along which San Juan ores thickened to minable widths would be a valuable addition to any new assessment of this property. Mapping of Drewes and Meyer (1983, map) suggests this fracture zone could be over 1,000 ft deep. Magnetic and electrical geophysical surveying methods would provide some of the data that are lacking.

The skarn dips to the south; its carbonate hosts are stratigraphically continuous to the east, but cut off to the west by Precambrian igneous rock (DR186, fig. 19, 21). Lateral and down dip extensions of the San Juan skarn were sampled by USBM. Topographic conditions suggest the deposit is at least partially eroded down dip, south of the San Juan Mine. Coring down the dip slope of the skarn from the main part of the San Juan Mine by Toltec Resources, Ltd. in 1992 intersected high grades: 39.8 ft of 3.11% Zn and 0.63 oz Ag/st, an interval which included 8.3 ft of 12.87% Zn and 0.88 oz Ag/st (Mining Record, 1992, p. 1). Drill collar location is not known. Thicknesses and grades reported are minable but no data are reported to support presence of minable tonnages. Skarn farther to the south of the San Juan Mine contains 0.66% Zn (simple arithmetic average of zinc content in 4 samples: DR219, fig. 19, 22; DR223-225, fig. 19). Skarn extensions east of the main part of the mined skarn, where skarn is well exposed, average 0.75% Zn in 11 samples (simple arithmetic average of zinc content, DR192-194 fig. 19; DR196-199, fig. 19, 20; DR202, fig. 19; DR220-222, fig. 19, 23).

Up the dip slope of the skarn, north of the San Juan Mine towards China Peak, USBM samples of the skarn contain 0.34% Zn (simple arithmetic average of zinc content in 6 samples, DR185, 187-191). These zinc concentrations are not economically minable. However, core assays reported by Toltec Resources, Ltd. in 1992 indicated higher concentrations of zinc could be found up-dip from the San Juan Mine: 4.98% Zn over a 4.4-ft interval (hole location not known by USBM) (Mining Record, 1992, p. 1). Another thin up-dip interval had 0.50% Zn over 3 ft. These zones are too thin to mine for zinc at this grade.

Farther to the north, on the slope of China Peak, a group of small prospects exposes more skarn (DR176-184, fig. 19, and detailed maps, fig. 24), but the average grade is low (0.60% Zn in five samples, DR176, 179, 181, 183-184, simple arithmetic average of zinc content). The zinc concentrations are low, but the samples are valuable in demonstrating the existence of more than one skarn in the San Juan-China Peak area. This zone may continue eastward to the Sorin Camp Mine area (see DR244, pl. 1, and prospect map, fig. 25), but lack of exposure prevents verification of this possible extension.

Future exploration/valuation of hypothetical discovery.--A best-case scenario for the possible exploration targets that have been noted (a., at depth, directly below San Juan Mine; b., between San Juan Mine and China Peak; c., north slope of China Peak by prospects DR176-183) would be discovery of another deposit like the best one known to date: the San Juan Mine deposit. PREVAL analysis of this model, a hypothetical, undiscovered deposit of the same size (15,000 st) and grade (9.7% Zn; 1.3 oz Ag/st) as the known San Juan deposit, suggests a loss of $58/st of ore mined and no recovery of capital costs (table 2). Grades used in the model are the composite San Juan Mine grade for zinc, and the silver average in samples of peripheral skarn in San Juan Mine. Lead is considered not recoverable, and too low to trigger smelter penalties.

Geophysical surveys (gravity, electric) might reveal larger, concealed, and perhaps more metallized skarns than those used in the PREVAL analysis.

<u>Muheim Mine area</u>

The Muheim Mine and related prospects about 1,000 ft east of San Juan Mine (fig. 19) are excavated on an eastern extension of the same skarn as the San Juan deposit, in a locality known as Zinc Basin (Mining Record, 1992, p. 1). The skarn is more steeply dipping than at the San Juan Mine area, but is just as thick: up to 25 ft. Production, however, was considerably less at the Muheim area. Total production was 217 st during 1924 and 1928 to 1929 (USBM-IFOC data, unpub.) from about 210 ft of excavations at the Muheim Mine (fig. 26); recovered metal from this ore is not known. USBM samples (DR236-239) contain >2% Zn in three samples (DR236 contained 1.9% Zn); more than 1% Pb; and appreciable silver (DR236, 1.5 oz Ag/st; DR237 and DR238, >5.8 oz Ag/st; DR239, 4.7 oz Ag/st). Toltec Resources reported ore-grade-level assaying from the Muheim Mine exposure of skarn as 4.38% Zn, 4.83% Pb, and 4.91 oz Ag/st (Mining Record, 1992 p. 1). The down dip extent is at least 80 ft (Anaconda Geol. Document Collection, document 8019, 1952).

The Muheim skarn extends southwest from the Muheim Mine for 300 ft to a prospect (DR234-235), where it is still thick (25 ft), but zinc concentrations diminish (1.1% Zn in outcrop, but >2% Zn in a skarn sample from the dump). Overall, zinc concentrations at the western extent of the Muheim skarn probably is comparable to the numbers reported by Toltec Resources (see above). The deposit may contain about 37,000 st of skarn, if continuous between DR234-235 and DR236-239, but this continuity is unlikely due to the heavily faulted nature of the skarn. Actual tonnage would therefore be lower. The skarn is covered east of the Muheim Mine. A southern skarn, of about parallel strike as the Muheim skarn, is intersected by a prospect adit about 200 ft down slope from Muheim (sample area DR227-233, fig. 27). This skarn, also heavily fractured, may be a splay of the Muheim skarn. Its metal concentrations were lower: 0.31% Zn, 0.025% Zn, and 0.9% Zn, respectively, in samples DR229-231. These are not economically minable concentrations.

Another group of prospects on skarn southeast from the Muheim area (fig. 19, sample localities DR240-243) is apparently known as the Lulty prospect (Anaconda Geol. Document Collection, document 8019, 1952), with the bulldozer excavations made sometime after 1952. Grades there are low: 0.091% Zn to 1.6% Zn in the four samples. Strike-length exposures are poor, 150 ft for the longest skarn, but skarn thicknesses are appreciable, 4-ft- to 17-ft-thick. Exploration would be required to demonstrate higher grades before any resources could be estimated at the Lulty prospect.

Economics.--PREVAL analysis of the Muheim area skarn, an inferred 37,000 st at grades of 4% Zn and 5 oz Ag/st, suggests a loss of $47/st of ore mined, and no recovery of capital costs (see details in table 2). There is just not enough contained metal value to pay for the costs of getting the rock out of the ground and milling it. Smelter charges could be higher than those in table 2, due to possible smelter penalties for lead. No lead recovery was considered in the model's flotation circuit, but the elevated lead content in the inferred resources (4.83%) may cause residual lead in the zinc concentrate to be high enough for penalty assessment.

<u>Abril Mine area</u>

The Abril Mine zinc skarns (fig. 29, DR156-166) are hosted in the base of a thick Naco(?) Group limestone bed, which is at most 100 ft above the Stronghold batholith, the mineralizing source. The intervening distance is occupied by quartzite. The lower Abril Mine skarn (fig. 29), source of essentially all the mine's production, strikes N. 20° W., dips NE. about 45°, and is 15-ft-wide, on the average. Widths reach 30 ft. The mineralized strike length is 50 ft to 150 ft at various levels in the mine. Above level 2, the skarn dip changes to the south. The upper Abril Mine skarn, about 100 ft above the hangingwall of the lower skarn (fig. 29) has been the source of only minimal production, apparently due to low grade and lack of continuity. The remaining measured and inferred zinc resources in the mine are within this upper skarn, which parallels the lower skarn. (See references in Appendix D, p. D42.)

Production of zinc and other metals from the Abril Mine took place mostly between 1944 and 1951. About 31,000 st were mined, with 8 million lb of zinc (from sphalerite) and about 0.4 million lb of copper (from chalcopyrite); a lesser amount of lead (galena) was recovered, and also a small amount of gold. As much as 50,000 oz silver may have been produced, but this was mostly from oxidized surficial deposits formed over the skarn. The certainty level of this silver production is low. (See production documentation in appendix D, p. D41-D42.) The property was originally staked in 1903 for the silver. During the time when most of the mining was done (1945 to 1949), zinc was the only ore metal, but since all ore was milled off-site in Bisbee, AZ, and Tombstone, AZ, it was possible to also recover copper, lead, and silver (and during one year, gold).

Historically, the mine has almost never been able to operate without Federal government financial assistance. The mine was capitalized twice by the Government; the access road was built by the Government; all work after 1950 was half financed by the Government; the vast majority of mine production (1946-1949) was done because the Government was paying a premium for zinc, and ceased as soon as the premium was discontinued.

Resources

The known deposit at the Abril Mine has been exhausted for the most part, and identified resources are small. Only 1,200 st of measured resource (5% Zn; see fig. 29, level 4, DR159) and another 16,000 st of inferred resource (12% Zn; see fig. 29, level 4, DR160-161) are known. Currently, these resources would not be mined alone, as the mine infrastructure has been removed, and it would not be economical to replace all the equipment needed to mine a deposit estimated to be less than 20,000 st in size. The resources could be mined in conjunction with another zinc or copper operation in the Middlemarch Canyon or at the San Juan-Muheim skarn, but there is no evidence this could be done profitably.

Possible deposit extension

The proximity of the Abril Mine skarn to the batholith (25 to 100 ft below) limits the possibility of down-dip continuity, and the erosion surface at the top of the deposit limits up-dip possibilities of continuity. A search for new ores could take place along strike to the north or south. Along strike, to the north, there is much talus cover. The possible northern extension of the Abril skarn (DR151-154, fig. 28, 30), and other skarn to the north (DR155, fig. 28), are both low in grade. Immediately south of the Abril Mine (level 1 adit, fig. 28, DR166), much of the skarn has been eroded. However, thin, poorly exposed skarns are found for a distance of 4,500 ft southeastward from the southern limits of the Abril Mine (DR167-175; see pl. 1 and mine maps on fig. 31), to the point where the northern extent of the San Juan skarns are encountered. Metals concentrations among these southern skarns are low: maximum 1.6% Zn (DR167), and one sample contained over 1% Cu (DR174); the silver maximum (DR175) was 3.1 oz/st.

Future exploration/valuation of hypothetical discovery

Exploration of the skarn trend, north and south of the Abril Mine, by geophysical surveying (magnetic and electrical) could locate drill targets; follow-up core drilling on any targets that may be found could locate an undiscovered skarn deposit. PREVAL modeling was applied to such a hypothetical, undiscovered skarn deposit along the Abril Mine trend; this hypothetical deposit was modeled as the same size and grade as the known Abril deposit (31,000 st with 12% Zn, 0.7% Cu, and 0.35 oz Ag/st) (see table 2). Results of the PREVAL analysis suggest the hypothetical deposit could be mined at a loss of $15/st ore mined and that no capital costs could be recovered.

Black Diamond Peak area

Introduction

The thick sedimentary pile southwest of Black Diamond peak is composed of lower Paleozoic strata (including Escabrosa Limestone, Abrigo Formation, and Bolsa Quartzite), Pennsylvania-to-Permian-age Naco Group rocks, and upper Bisbee Group rocks; there are numerous carbonate units in this section. These strata are cut by numerous northwest-trending fractures, and fewer northeast-trending fractures (see fig. 32) (Drewes and Meyer, 1983, map). The Black Diamond fault, along which skarns of the Black Diamond deposit are developed, is the most prominent of the fractures. It is interpreted as a high-angle, southwest-dipping, Precambrian-age feature, reactivated after Permian time. After deposition of more sediment in the Cretaceous, compression from the southwest caused intense contortion of the sedimentary pile *against* the Black Diamond fault. Later, there was extension of the area and intrusion at depth by the Stronghold batholith, accompanied by late stage Tertiary dike intrusion, and metallization at several sites. The metallization has been attributed to the batholith (Keith and Barrett, 1976, p. 181-183, 187-195).

This mineral setting applies to all mine workings on fig. 32 including Black Diamond Mine, Escapule Mine, Festerling Mine, Standard Tungsten Mine, the Silver Cloud patent, and numerous small unnamed prospects among these mines (DR300-435). Mineral deposits and occurrences are varied in mineral content: some are mainly copper or zinc with some silver and others are mainly precious metals. One is a tungsten occurrence.

Black Diamond Mine

Copper-silver deposition in skarns at Black Diamond Mine (see inset map, fig. 33, and detailed mine maps, fig. 34, 35, 36, samples DR372-435), is along part of the northwest-trending Black Diamond fault zone. The deposit consists of a main productive skarn (DR374-377, DR385-386), which has been mined for 3/4 of the ores produced during the life of the mine. This skarn is confined to a northwest-trending fault zone through limestone (fig. 35, 36). A second, subparallel skarn (DR372-373, DR384; see fig. 35, 36) cuts this same limestone nearby, but is much smaller. Other skarns of similar size and orientation may be confined in fault zones in limestone along the southeast perimeter of the mine. This is based on reported geology at depth in the shaft by the Bagge level portal (fig. 34). However, no skarn has been mined there, and the structure and trends of skarn there are speculative.

A second variety of skarn, massive, and magnetite-rich, occupies the central part of the Black Diamond Mine workings, and is the dominant rock type encountered in the outer half of the workings on both the Bagge and Dividend levels (fig. 34, 35). This massive, magnetite-rich skarn crops out, where it was explored by small workings [see fig. 36, sample sites DR380-382, and the Queen level workings (unsampled)]. The bulk of the magnetite-rich skarn rock was never a mining target (fig. 34, DR423, DR428-430; fig. 35, DR394, 400-403). It is not significantly metallized. Thin fractures *within* this magnetite-rich skarn were mined for copper-silver sulfides (fig. 34, DR416-421, DR424-427, DR431-432; fig. 35, DR389-393, DR395-399, DR401), but collectively, they have provided the minority of the mine's total production, and contain no metallic resources under 1993 economic conditions (see resources section, below).

The total Black Diamond deposit, somewhere in the size range of 12,000 to 37,000 st, has been mined, producing approximately 1.15 million lb copper (sulfide), 12,000 oz silver, 15,000 lb zinc, and a small amount of gold. Nearly all the copper and half the silver were mined before 1908. (See deposit size and production documentation in Appendix D, p. D125-D126.)

Resources/valuation of speculative deposit.--Some extension of the productive skarn (DR374-377, DR385-386) and its nearby, subparallel skarn (DR372-373, DR384) is possible in unexcavated ground to the northwest of the mine perimeter, along the N. 40° to 50° W. strike, for a maximum distance of 150 ft along strike (see fig. 36). Northwest of that point, the skarn pinches out. That only 150 ft of strike length have exploration potential for more metallized skarn is discouraging, and decreases the possibility that any large tonnage of metallized skarn could be found there. There is no southeast extension of the major Black Diamond Mine skarns along strike (DR374-377; DR385-386). The skarns are clearly truncated on their southeast ends by the pervasive porphyry dike that was intersected on each mine level (fig. 34, 35, 36). Available data are also negative for possible down-dip extension of these skarns: the deepest exploration of the mine, a 300-ft-deep winze in the Bagge level (fig. 34), revealed that skarn is present, but of low grade (Mattox and Mattox, 1938, p. 2). The skarns have been mined essentially to the topographic surface, eliminating up-dip possibilities. Because of these structural limitations, no resources are estimated for this part of the Black Diamond deposit.

Resources may exist in the relatively unexplored skarn, exposed at the bottom of a 293-ft-deep shaft by the Bagge level portal (see fig. 34, shaft 50 ft west of sample site DR434). It is probably hosted in relatively unaltered limestone (Escabrosa?), as are the DR374-377/DR385-386 skarn and DR372-373/DR384 skarn. Orientation of this skarn below the Bagge level portal is unknown, but it is most likely northwest-trending and southwest dipping. It reportedly contains 32% copper (Mattox and Mattox, 1938, p. 2). Considering the probable host of this northeastern skarn, it permissively could contain a deposit like the one that was exploited from the Dividend level (Bulkhead Stope, Big Stope, fig. 35), through the Intermediate level (Intermediate Stope, fig. 36), and up to the No. 2 Crosscut (fig. 36).

Considered as a speculative class of resource, this skarn could be as large as 37,000 st (as large as the entire mined part of the Black Diamond deposit), with historical Black Diamond Mine grades of 6% Cu and 10 oz Ag/st. PREVAL analysis of this speculative deposit suggests that it could not be capitalized and mined profitably (see table 2) due to low overall tonnage.

An operator with all capital needs in hand, and experience in mining small, low tonnage copper skarns, possibly could realize a profit through the delineation and mining of this speculative deposit. Zinc (0.03% in ores mined in the 1940's) and gold (trace amounts usually, but as much as 0.08 oz/st, as in sample DR385) are not considered in this PREVAL analysis due to low concentrations. Lead is also economically negligible.

The massive, magnetite-rich skarn is cut by numerous shears and fractures, some of which have been stoped for copper ores on Bagge and Dividend levels, where several orientations of shears or fractures intersect (see fig. 35, samples DR396-399, and fig. 34, sample DR420). The magnetite-rich skarn itself was not the target of mining. Stopes on fractures within the magnetite-rich skarn exploited sulfide copper-silver deposits that are much smaller than deposits hosted in relatively unaltered limestone (discussed above). The largest was approximately 5,000 st (Dog stope, fig. 35, 36). Deposits this small cannot be exploited profitably, at the expected commodity grades. This suggests exploration for new deposits in the massive, magnetite-rich skarn is not warranted.

Dumps, stockpiles, smelter slag.--Combined dumps of Black Diamond Mine contain less than 25,000 st of rock, with most of the tonnage by the Dividend level portal (see appendix D, DR372-440, for details). Only two stockpiles are known on the property: one at the Bagge level portal (DR435) is about 10 st, a negligible amount of rock; another at the former smelter site (DR438) is also of very low tonnage (about 100 st). Both have elevated copper and silver content (appendix D, DR372-440). Neither is considered a resource due to small size. Either could easily be processed as part of another operation in the region.

The slag remaining on the former site of Black Diamond Copper Mining Co's. smelter was sampled (DR437,439-440, pl. 1), revealing low copper (0.65% Cu, maximum) and gold only in trace amounts. Silver is less than 1 oz/st. Slag tonnage is low (9,000 st). The smelter site is 1.5 mi east of the mine (pl. 1).

Gold prospecting.--Cordyne Corp. (1979 to 1982 or 1983) and Manhattan Minerals Corp. (1992) have both investigated the patents of Black Diamond Mine for gold. Manhattan Minerals work carried over into National Forest land northwest of the patent boundaries (fig. 33). There is no appreciable gold within the mine itself, but prospecting has moved northwestward of the saddle on the Procrastination patent, an area where Manhattan Minerals completed 9 exploratory drill holes in the summer of 1992. Limited sampling of the Black Diamond fault zone in this area by the USBM in 1992 (DR370-371) did not reveal high gold concentrations (11 ppb Au, maximum). Another USBM sample (DR365), collected in the Black Diamond fault zone at a shallow shaft (see fig. 32) contains 10 ppb gold.

Drill data and assays collected by Manhattan Minerals and Cordyne, which may reveal different gold concentrations, were not available to the USBM for this analysis. The site remains an active prospect. Other faults interconnected with the Black Diamond fault have also been investigated by exploration drill holes in the last 20 years. The sites are analyzed in some of the following sections of this report.

Festerling Mine

Festerling Mine's (DR316-326, fig. 32) main point of interest is that it is on the Black Diamond fault zone. Most of the workings are inaccessible shafts; the lone adit on the property was locked by a gate in late 1989 and access was not obtained. The Black Diamond fault zone was sampled in outcrop at several sites on the property, and most contain subeconomic metal concentrations. The highest concentrations obtained from the fault zone are >3% Zn and about 1 oz Ag/st where mildly silicated carbonate rock in the fault is intersected by granite. Excavations there include a glory hole, and an interconnecting inclined shaft and adit (DR320-323). The very limited tonnage produced from the mine (<25 st), the concentration of workings on a small section of the fault zone, and mineralogy observed there lead to the conclusions that this is a very small skarn deposit. It is locally of high grade in zinc, copper, lead, and silver, where it was intersected at or very close to the contact of the granite and limestone. Economic concentrations of metals did not extend further along the fault. No resources are estimated due to the probable limited extent of the deposit.

Workings on the Escapule fault zone

The Escapule fault zone, as mapped by Phelps-Dodge (1979, map), is approximately parallel to the Black Diamond fault zone, and 1,000- to 1,500-ft to the west (fig. 32). Workings on the 5,000-ft-long fault are limited to the Moonlight Mine (120 st of zinc, silver ores mined, fig. 37) and a group of prospects 2,000 ft to the northwest (DR329-334, fig. 38). The Moonlight Mine contains an estimated 3,500 st of low-grade zinc-silver rock, with uncertain structural continuity and low grades. The prospects to the northwest on the Escapule fault zone (fig. 38) contain elevated zinc (>2%) in an unknown form, but have no structural data recorded. Another group of prospects (DR335-341, fig. 38) follow a northeast-trending fault of short strike length that intersects a more pervasive northwest fracture trend (fig. 32). This northwest fracture trend is south of and sub-parallel to the Escapule fault zone. The prospected structures are thin (4-ft-thick, maximum) and contain gold concentrations that are not economic in structures this small (0.11 oz Au/st, maximum).

Silver Cloud patent and northwest-trending fault zone

A 5,000-ft-long, northwest-trending fault zone (mapped by Phelps-Dodge, 1979, map) extends north from the Silver Cloud patent (fig. 32). Prospects on this zone are more numerous than any of the three northwest-trending fault zones that are southwest of and sub-parallel to Black Diamond fault zone (fig. 32). The prospects themselves, however, are mostly on splay faults of short strike length that intersect the more pervasive northwest fracture trend (DR327-328,343-348,350-352, fig. 32, 39, 40). Mineralized rocks in this zone are characteristically carbonate rocks with silication, thin structural widths, and unknown strike lengths (talus cover). Zinc, silver, and gold are frequently encountered in samples, but usually in low concentrations. The most favorable of the prospects is DR348, with zinc and lead above 1%, 2.5 oz Ag/st, and 0.02 oz Au/st. This 2-ft to 4-ft-wide fracture zone may extend further northeast, but wasn't traced in detail due to lack of time. Overall, considering the low grades, thin structural widths, and lack of control on strike lengths, no resources were estimated at any the seven sites. (See supporting data in appendixes B, C, and D.)

Tungsten occurrence

Standard Tungsten Mine is on a northwest-trending fracture zone, subparallel to and west of the Black Diamond fault zone (fig. 32; Phelps-Dodge, 1979, map). There is no geologic evidence that this is a skarn-type occurrence. Production has been negligible. The tungsten's granite source may be other than the Festerling Mine granite; tungsten was negligible in most Festerling Mine samples. The best reported tungsten concentrations on the Standard Tungsten property, 0.37% WO_3 (Johnson, 1951a, p. 1), could not be verified by USBM sampling at the site (DR304-305) because sloughing concealed the tungsten-bearing zone. The highest tungsten concentration in USBM samples is 0.094% WO_3, or about 10% of the economic cutoff grade. Lack of known structural continuity is also a negative factor in economic analysis of this property. No resources were estimated at the site due to unfavorable grade and lack of structural data. The barite occurrence on the west part of the property was not exposed to an extent that it could be evaluated (DR313-314).

Gordon Spring and Sala Ranch prospects

These shallow prospect excavations, along the southern boundary of the Dragoon Mountains Unit (pl. 1; fig. 50-51), are at the area where Stronghold batholith granite crops out and/or contacts the sedimentary rocks. Faults and contact zones were the typical prospect target. The only elevated metal concentration in 29 rock-chip samples are at contact metamorphic zones. No such zones or any other structures exposed here are suggestive of potential mineral resources.

<u>Skarns in northern half of Dragoon Mountains Unit</u>

There are several fault-controlled skarns in the northern half of the Dragoon Mountains Unit. These include the copper-zinc skarns and zinc or lead-zinc dominated skarns. A few of them also have low concentrations of silver that could be recovered if the base metals were mined. Combined production of all seven sites is under 1,300 st, based on recorded figures, although as much as a few thousand tons more may have been produced at the Seneca Mine.

Copper-zinc dominated skarns

The Seneca Mine skarn (fig. 41-43) was worked for a few hundred st of ores with 30% Zn and 1% Cu in sulfides from lenticular high-grade zones during WWII. This production likely came from adit DR125-126 (fig. 41), which was inaccessible for the USBM Coronado study. The skarn mined at the level of adit DR125-126 is likely a separate, non-outcropping, lower skarn from the one examined on the property by USBM at sites DR122-124, 127-129. The supposed upper skarn is faulted and is exposed in adits DR122-124, DR127, and DR128-129. At least 1,000 st of skarn have been removed from the DR122-124 adit. The copper, zinc, and silver concentrations decrease at the upper, western extent of this skarn, but are appreciable at the down-dip, eastern part of the skarn. Samples DR122-124, DR127 contain weighted average metal contents of 0.95% Cu, 2.2% Zn, and 2.2 oz Ag/st. Hypothesized continuity between site DR122-124 and site DR127, and further assumed, untested geologic continuity to a point midway between the DR127 and DR128-129 adits (fig. 41) allows an inferred resource tonnage of 31,000 st of the 6-ft-wide (average) skarn. PREVAL analysis of this inferred tonnage suggests contained metal values are too low to meet mining and processing costs, and that no capital costs could be recovered (table 2). Documentation for production, grades, and deposit dimensions are in appendix D, p. D35-36).

The Jordan Canyon prospects (fig. 5) are also copper-dominated skarns. However, no metal concentrations of economic levels were found there, and no structural continuity can be demonstrated. No production is thought to have occurred from the Jordan Canyon prospects.

Zinc and lead-zinc dominated skarns

The Rainbow patent lead-zinc skarn (fig. 5, DR76-79), based on old mine development reports, could be the largest skarn in the Dragoon Mountains Unit: 100,000 st (inferred) of skarn material. Geologic parameters used to derive that estimate are documented in appendix D,(p. D26-27). However, an owner of the patent, many years ago, estimated a 40,000 st deposit at the site, based on essentially the same development work. The low grade is the main detrimental aspect of the Rainbow property. Rocks contain about 4% lead and 1% to 2% zinc. The low grade of the primary metal, lead, and its current (1993) low price, combined with a moderate-to-low tonnage, suggest this property is not economic. (See appendix D for details.)

A lead-zinc skarn at the Naoe claims (fig. 5, 48) could contain as much as 50,000 st (inferred) of skarn. The continuity necessary to support that much tonnage is unproven. Geologic parameters used for that estimate are discussed in appendix D (p. D33). Overall zinc grades are probably less than 1% Zn, which is not an economically minable concentration of the metal. Of the eight samples collected at the prospect workings, four exceed 2% Zn (DR112, 113, 117-118), but the rest contain far less than 1% Zn (DR111, 114-116). The four samples with >2% Zn were *not* re-assayed at higher detection limits to determine their exact zinc concentration. The prospect was initially staked and mined for lead, but the recorded production of lead ores is very small (3 st); this probably was mined from surficial oxidation zones. Four of the samples collected from the skarn contain >1% lead (Pb) (DR112-113, 117-118), but the other four samples contain far less than 1% Pb. The low concentration level and the low commodity price of lead were factors in deciding not to re-assay the samples for ore-grade levels. No further economic analysis was undertaken.

No resources are thought to be present for the zinc skarns of the St. Francis Mine (fig. 44-45), Hubbard Mine (fig. 47), and Buena Vista Mine (fig. 46) due to small deposit size. The lead-zinc skarn at the Burrito de Fierro Mine (fig. 46), which is outside the National Forest, is also considered too small to constitute a mineral resource. (See details in appendix D.)

Auriferous quartz-veins

Thin, gold-bearing quartz veins were mined in the Golden Rule district, which adjoins the north-east part of the Dragoon Mountains Unit (fig. 52). Peripheral prospects of the southern end of the district are about 200 ft north of the National Forest boundary. They were examined briefly in the USBM RARE II study (Kreidler, 1981), and the pulps were re-assayed for the current Coronado study. Little time was spent on the area, because it is outside of the National Forest. One of the closest prospects was re-examined for the Coronado study. Quartz vein material on a dump (sample DR8, fig. 53) contained 0.14 oz Au/st. That amount is geochemically anomalous, but is not economic in thin veins; mining of thin gold-bearing structures by underground methods in general (at the early 1993 price of $350/oz) requires concentrations closer to 1 oz Au/st for profitability. This is not to say that no gold mineralization of the Golden Rule district will be found inside the National Forest, but no such occurrences are known at this time. No pervasive alteration zones were noted inside the National Forest on the Golden Rule district periphery, so no samples were taken in search of disseminated gold in the sedimentary strata there. Detailed mapping of the underground mining in the Golden Rule district (outside of the National Forest) is in Hampf (1972). That work was not reproduced in this report.

CONCLUSIONS

Marble quarries along the north end of the range could be re-activated and quarried for colored marble landscaping chips, a popular alternative to lawns in the region. However, there is competition in place from many other non-marble, natural stones. Conducting of a market study to predict the marble product's performance is essential prior to any quarrying. The total 270,000 st colored chip marble resource in the Dragoon Mountains Unit could net approximately $6.5 million if all were mined and sold, but it is unlikely that the region would absorb all of this output. Small producers would be the likely potential operators if any of these quarries were re-opened. The large resources of white marble (2.4 million st) are unlikely to be further developed (they previously supplied terrazzo and roofing granules), because their current (1993) application is probably limited to roofing granules, where existing competition is in place and closer to markets. Some colored dimension marble was produced from the Unit, but the potential is hampered by the heavy fracturing in the rocks, induced by faulting in the region. Other carbonate rocks (limestone, dolomite) are pervasive, but only about 2,000 st were quarried (possibly for crushed aggregate); the limestones may be useable as portland cement raw material at a future time, if environmental and population pressures in the Tucson, AZ area push existing cement manufacturing firms to seek new locations. Detailed chemical testing of the limestones (not done), is essential for a complete characterization of the rock for this application; detailed mapping of the carbonate rock units also must be undertaken.

The metal production from Dragoon Mountains Unit skarns came essentially from just 5 mines. No one deposit exceeded 40,000 st. Black Diamond, Middlemarch, and Cobre Loma Mines account for most of the copper production. Black Diamond mining was essentially finished by about 1908; the Middlemarch and Cobre Loma properties produced little or no ores after 1920. The shutdowns all were attributed to low copper prices, but there are little or no known remaining ores in any of those three mines. Zinc production came mostly from the Abril and San Juan Mines. Abril, the biggest producer in the entire Dragoon Mountains Unit, was almost never able to operate without Government assistance, including zinc price supports. Essentially all the production at the San Juan Mine also was mined during times of price supports.

Skarns with copper, zinc, and silver were appraised, using field observations, available geologic data (drill cores, smelter returns, etc.), and geologic and economic models to estimate whether any could be mined profitably, or if it would be profitable to search for more of the range's best known types of deposits along recognized mineralized trends. Results were strongly negative, mainly due to small estimated deposit sizes. The largest expected deposits in the range are about 30,000 st to 40,000 st. From available information, it appears that no skarn deposit that could be discovered/delineated in Middlemarch Canyon and other parts of the Unit would be large enough to support extraction and capitalization costs. However, a company experienced in mining of small, shallow metal sulfide bodies, self-financed, and with the required mining and milling equipment in hand, could realize economies not factored in to the USBM economic estimates.

Exploration for copper-zinc-silver skarn deposits has taken place at least somewhere in the Dragoon Mountains Unit nearly every year since mining essentially ceased in the late 1950's. Middlemarch Canyon has seen nearly all of the activity in the past thirty years (including 1992), mainly due to pervasive copper concentrations and potentially extensive overall length of the mineralization trend. Continued small-scale exploration in this area should be expected due to these geologic characteristics. No large deposits are known, and there is no geologic evidence available to the USBM to suggest any mining will result in the foreseeable future. However, much of the exploration data from this area were not available to the USBM, and some of those drill or geophysical data may indicate higher grades or larger deposits than those used in the economic models in this report.

Gold exploration results from 1992 drilling in the Black Diamond fault zone on patented land immediately north of the Black Diamond Mine were not available to the USBM. The exploration work may continue. USBM samples prove that gold occurs in the fracture system, but at quantities far below ore grade. Not enough data are available to adequately characterize the economic potential of the fault zone.

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EXPLANATION OF SYMBOLS FOR REPORT FIGURES AND PLATES, INCLUDING:
Inset maps at various scales and 1:126,720-scale plates.

APPROXIMATE BOUNDARY OF THE FOREST MANAGEMENT AREA

APPROXIMATE BOUNDARY OF WILDERNESS

NATIONAL MONUMENT BOUNDARY

6000 TOPOGRAPHIC CONTOUR–Showing elevation in feet above sea level

STATE LINE

COUNTY LINE

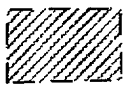
PRIMARY SECONDARY ROADS

UNIMPROVED ROADS TRAILS

INTERMITTENT STREAMS

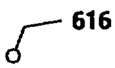
MINING CLAIM BOUNDARIES

GRID TICK MARK

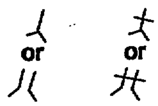


PATENTED MINING CLAIM

SURFACE OPENINGS–Showing sample number(s); symbols may represent more than one working. Also, VARIOUS REPRESENTATIONS OF SAMPLE SITES:



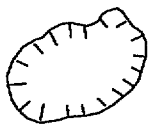
Rock sample locality–Showing sample number



Adit open (left); Adit, inaccessible (right)

Trenches

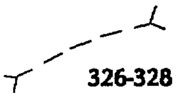
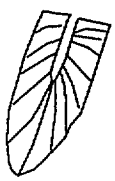
Open cut



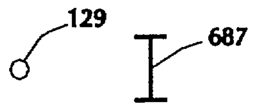
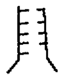
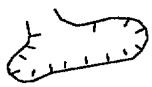
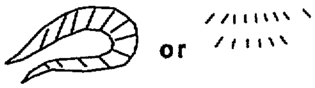
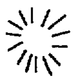
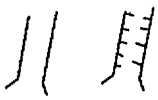
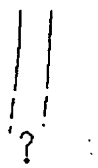
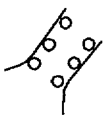
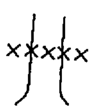
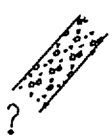
Glory hole, open pit, or quarry

EXPLANATION OF SYMBOLS FOR REPORT FIGURES AND PLATES, INCLUDING:
Inset maps at various scales and 1:126,720-scale plates–Continued.

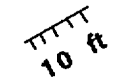
SURFACE OPENINGS–Showing sample number(s); symbols may represent more than one working. Also, VARIOUS REPRESENTATIONS OF SAMPLE SITES–Continued:

846 	Prospect (pit, open cut, or small trench)
 326-328	Tunnel
	Mine or quarry (active, left; inactive, right)
	Placer mine or gravel pit (active, left; inactive, right)
	Shaft, open to surface (left); Shaft, inclined (right)
	Shaft, water filled (left); Shaft, caved (right)
 R	Shaft, reclaimed
	Mine dump
 DHxxx	Drill hole collar

EXPLANATION OF SYMBOLS FOR REPORT FIGURES, INCLUDING:
Features of detailed mine maps, both surface and underground, at various scales (larger than 1:24,000).

	ROCK SAMPLE LOCALITY--Showing sample number
	TRENCH
	PITS
	OPEN CUT
	DUMPS
	STOCKPILE
	ADIT PORTAL (left); ADIT PORTAL WITH TRENCH OR OPEN CUT (right)
	LEVEL WORKING--Dashed and/or queried where uncertain
	INCLINED WORKING--Showing degree of inclination, chevrons pointing down; queried where uncertain or inaccessible
	TIMBERED (Vertical timbers and/or lagging)
	CAVED
	RUBBLE (BACKFALL) FILLED, MUCK-FILLED, OR BACKFILLED WORKING--Queried where uncertain or inaccessible

EXPLANATION OF SYMBOLS FOR REPORT FIGURES, INCLUDING: Features of detailed mine maps, both surface and underground, at various scales (larger than 1:24,000)--Continued.



STEP DOWN IN SILL--Showing drop in feet; hachures on down side

RAISE, head (left); RAISE, foot (right)

RAISE GOING UP AND WINZE GOING DOWN

WINZE--Noted if water filled

MANWAY (left); CHUTE (right)

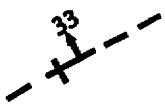
SHAFT, open at surface (left); SHAFT, bottom (right)

P

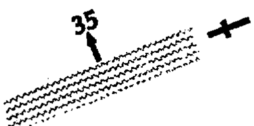
PILLAR

GEOLOGIC SYMBOLS

Strike and dip of bedding

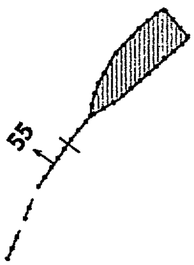


Fault--Showing strike and dip (inclined or vertical, degrees); dashed where approximate



Fault zone or shear zone--Showing strike and dip (inclined or vertical, degrees); dashed where approximate

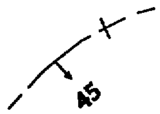
Thrust fault--Sawteeth on upthrown side



Vein--Showing strike and dip (inclined or vertical, degrees); dashed where approximate

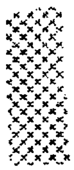
EXPLANATION OF SYMBOLS FOR REPORT FIGURES, INCLUDING:
Features of detailed mine maps, both surface and underground, at various scales (larger than 1:24,000)--Continued.

GEOLOGIC SYMBOLS--Continued

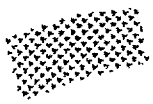


Contact--Showing strike and dip (inclined or vertical, degrees); dashed where approximate

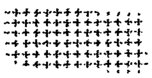
Dike--Showing strike and dip (inclined or vertical, degrees); dashed where approximate



Shattered zones



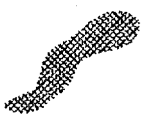
Brecciated zones



Igneous rock ~~zone~~ or structure

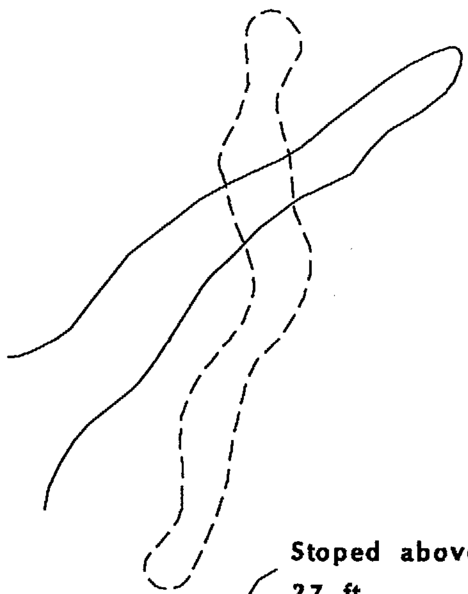
Mineralized zone, disseminated

Mineralized zone, localized

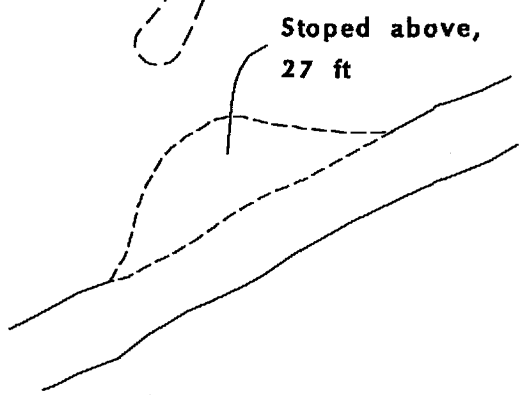


Zone containing resources

EXPLANATION OF SYMBOLS FOR REPORT FIGURES, INCLUDING:
Features of detailed mine maps, both surface and underground,
at various scales (larger than 1:24,000)--Continued.



Multiple level workings



Stope

Symbols for vertical cross-section maps

Crosscut

Drift into facing wall

Drift into removed wall

Drift into facing and removed wall

Water-filled winze

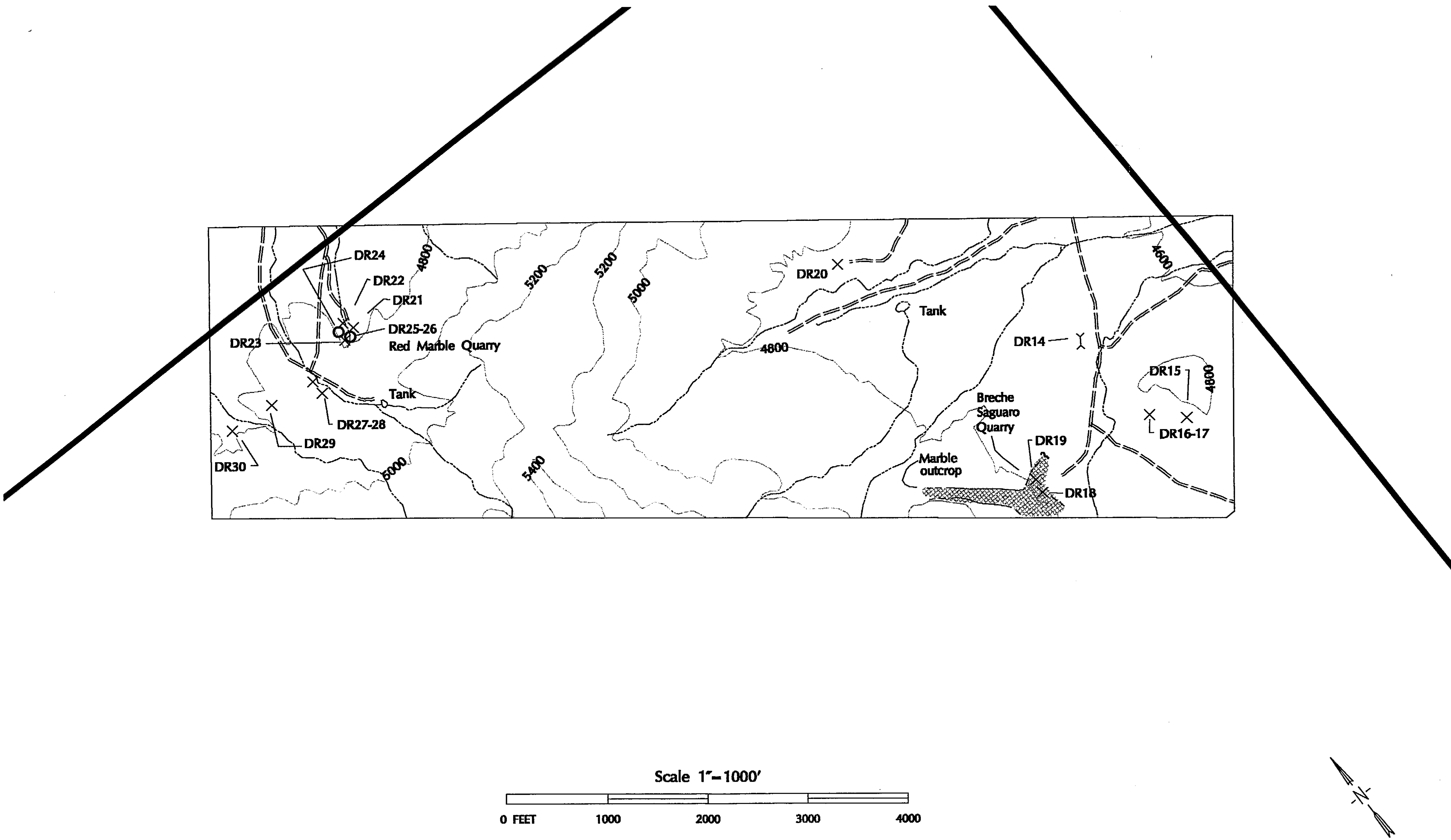


Figure 2.– Marble, limestone, and dolomite quarries and prospects, with sample localities DR 14-30, Dragoon Mountains Unit.

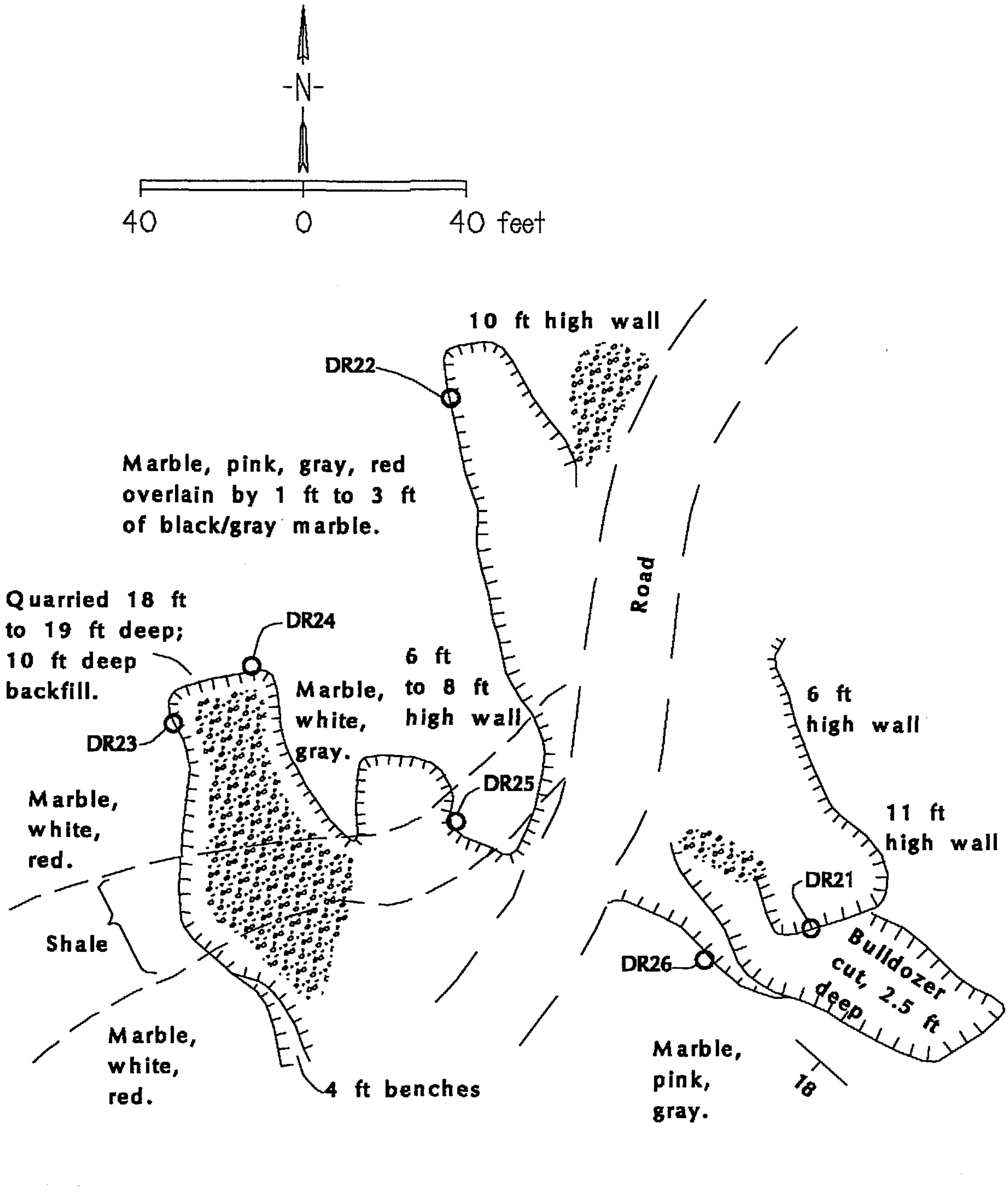


Figure 3.--Red Marble Quarry, with sample localities DR 21-26, Dragoon Mountains Unit. Locations of DR 24-26 approximate. One of Ligier-Arizona Marble Quarries.

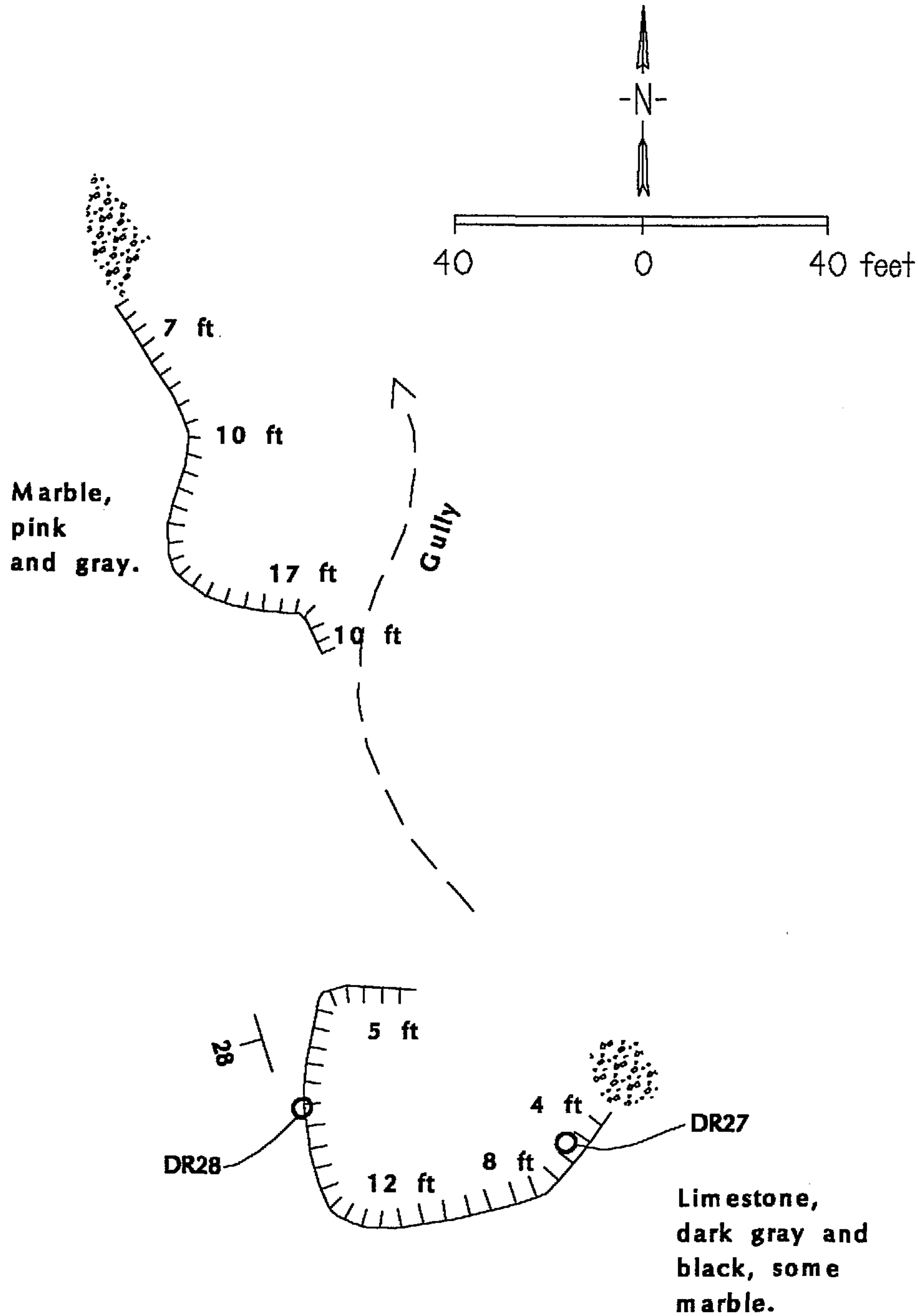


Figure 4.--Limestone quarry, with sample localities DR 27-28 and unnamed marble quarry, both part of Ligier-Arizona Marble Quarries, Dragoon Mountains Unit.

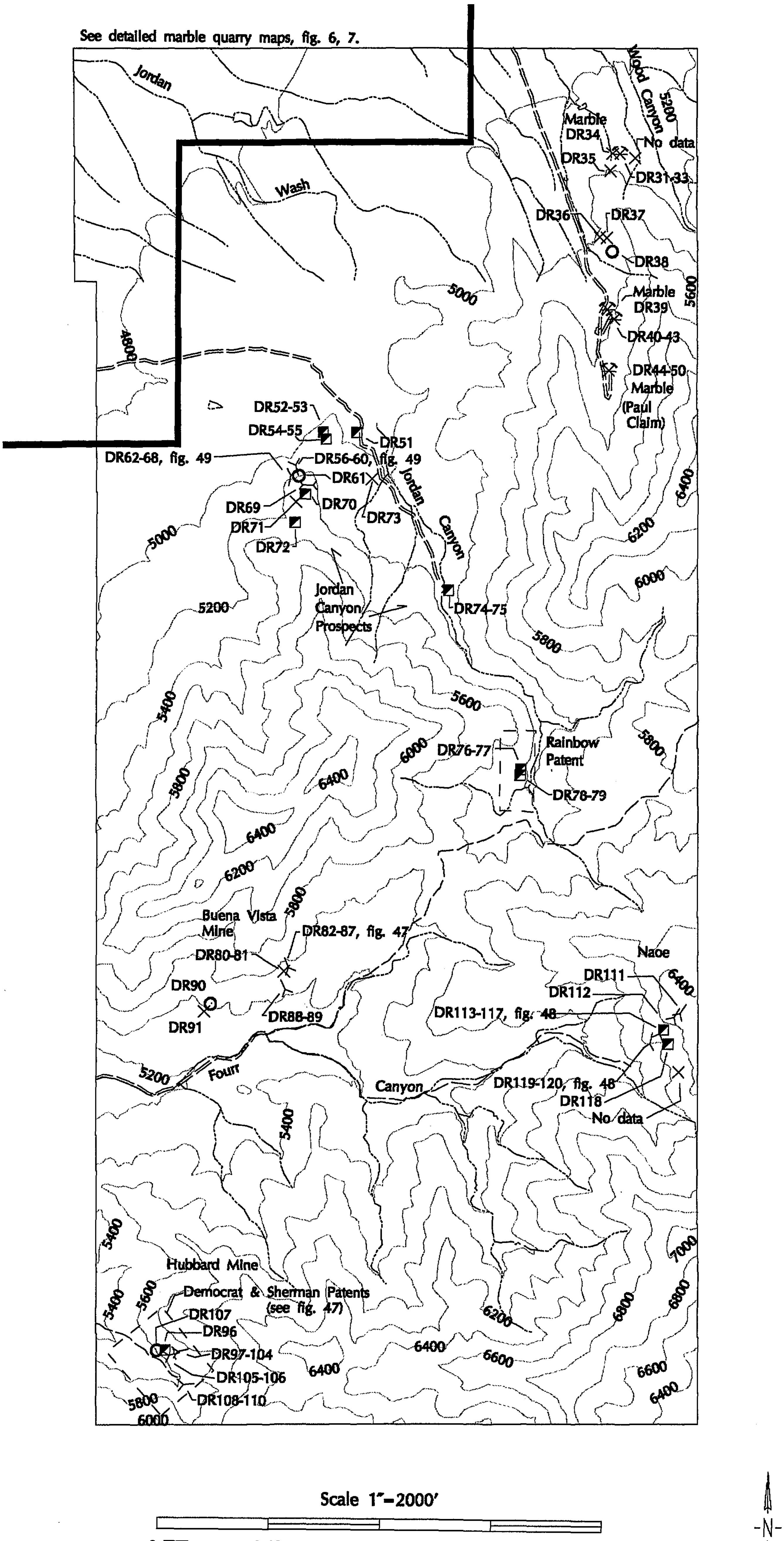


Figure 5.– Mines and prospects with sample localities DR 31-91, and DR 96-120, northwestern Dragoon Mountains Unit.

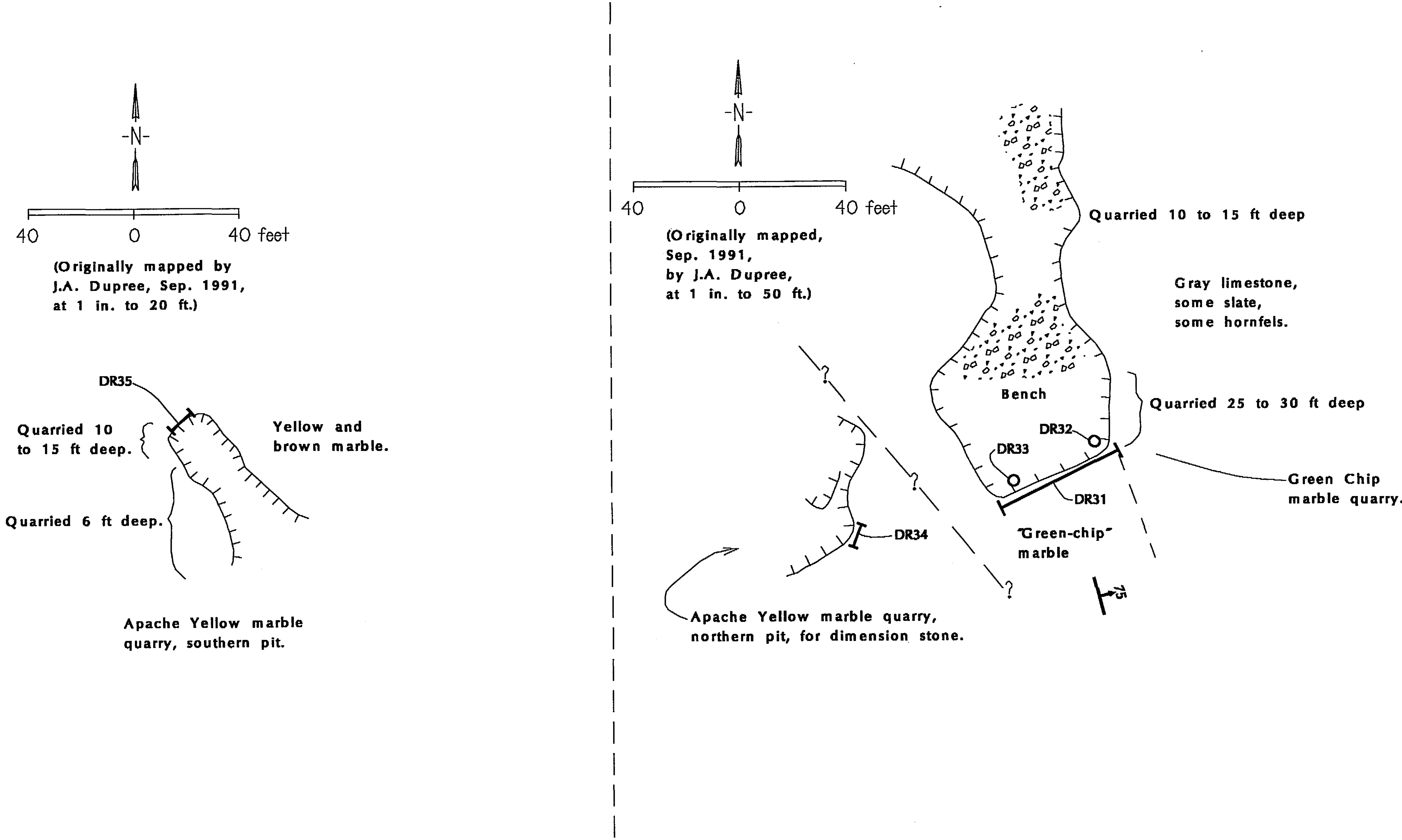


Figure 6.--Apache Yellow marble quarries, and Green Chip marble quarry, part of Ligier-Arizona Marble Quarries, with sample localities DR 31-35, Dragoon Mountains Unit.

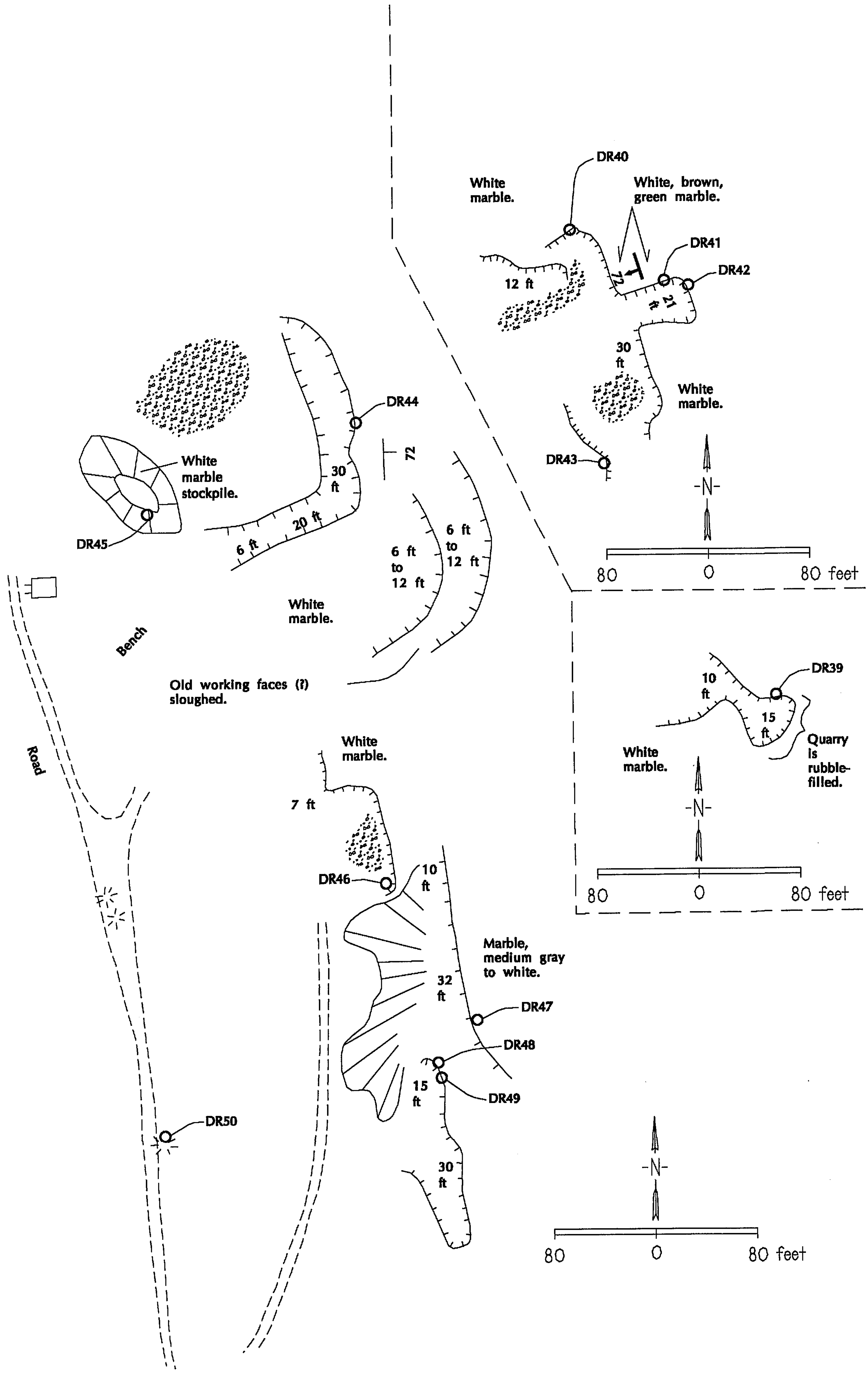


Figure 7.—White marble quarries, part of Ligier-Arizona Marble Quarries, with sample localities DR 39-50, Dragoon Mountains Unit. All mapping originally at 1 in. to 100 ft by Robert C. Smith and D.K. Marjaniemi, Apr. 1991.

Figure 8.--Yellow-sienna marble, at quarry site DR 16-17, Dragoon Mountains Unit. Thirteen-in.-long rock pick provides scale.

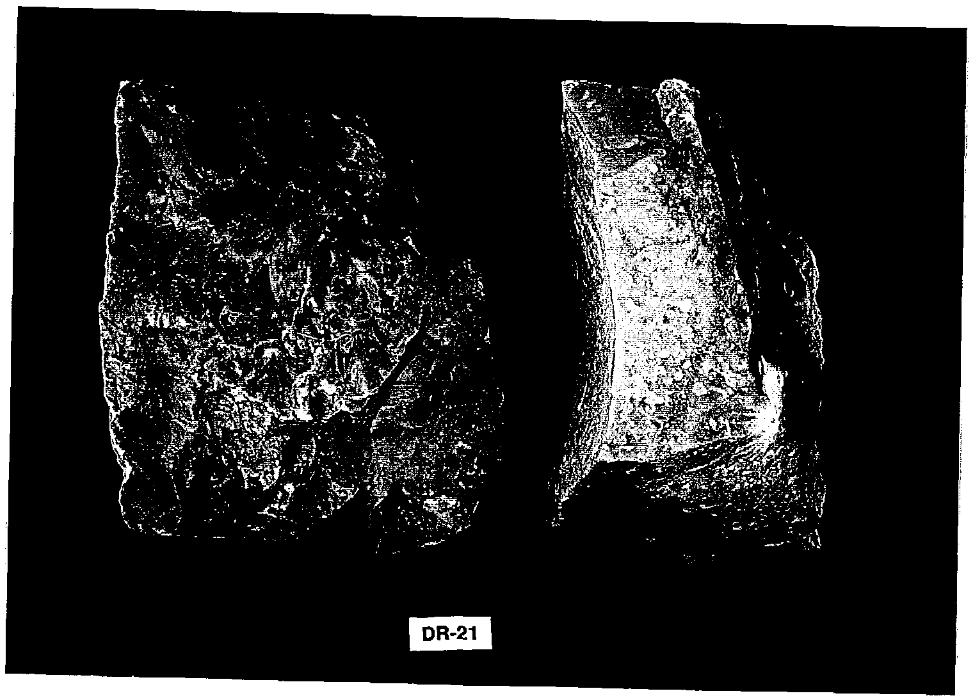


Figure 9.--Red-pink marble from Red Marble Quarry, sample DR21, Dragoon Mountains Unit. Specimen on left is 3 in. across.

Figure 10.--Marble from the Green Chip quarry, sample DR31, Dragoon Mountains Unit. Specimen on right is 6 in. across.

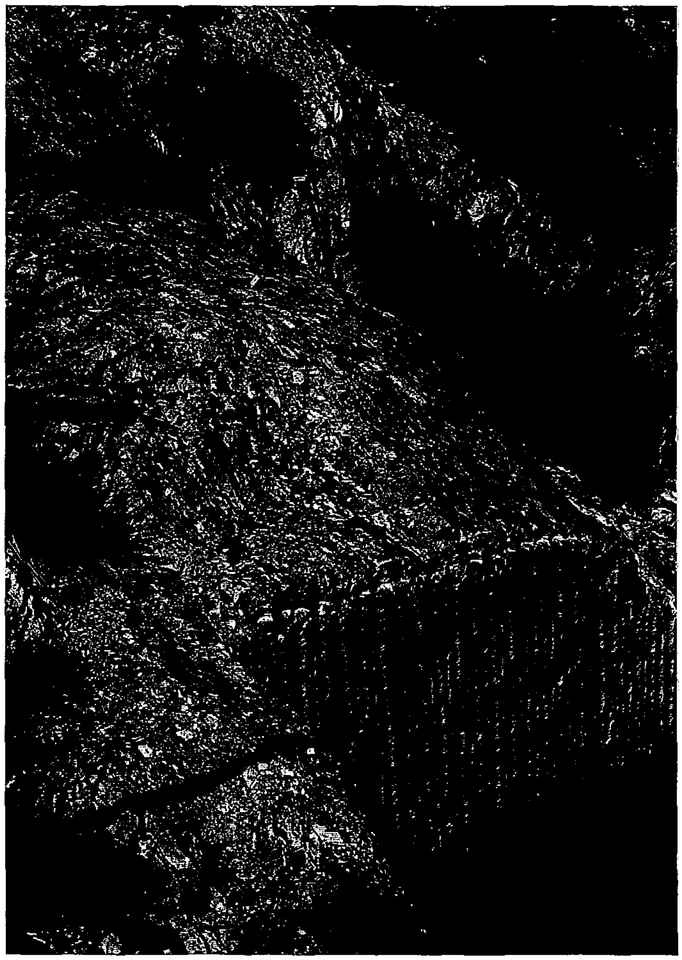


Figure 11.--Breche Saguaro dimension marble quarry, site of sample DR18, Dragoon Mountains Unit. Thirteen-in.-long rock pick provides scale.

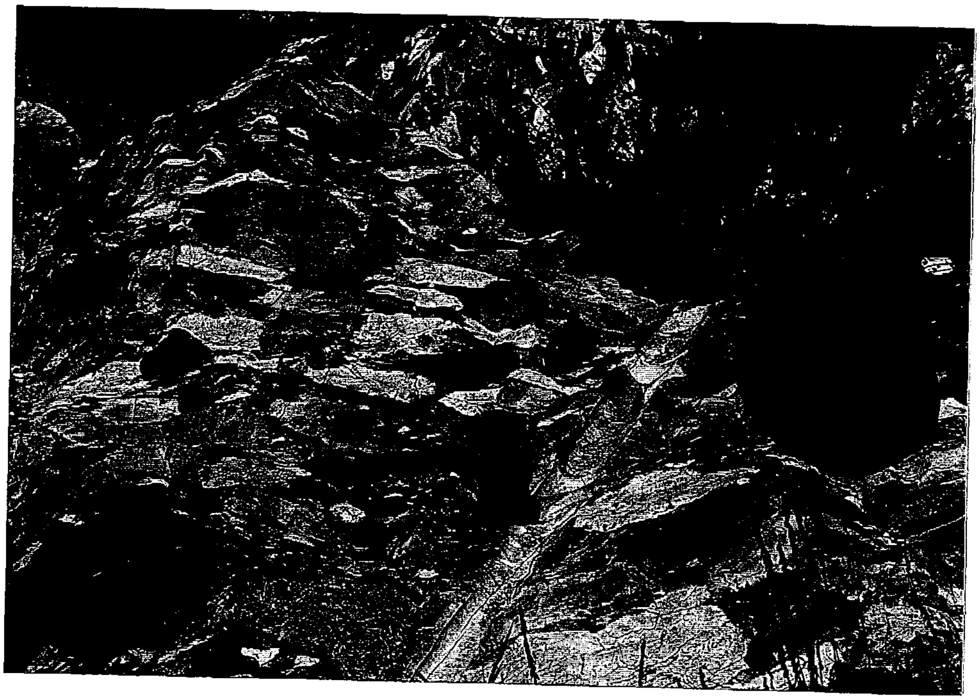


Figure 12.--Detail of the marble from Breche Saguaro quarry, sample DR18, Dragoon Mountains Unit.

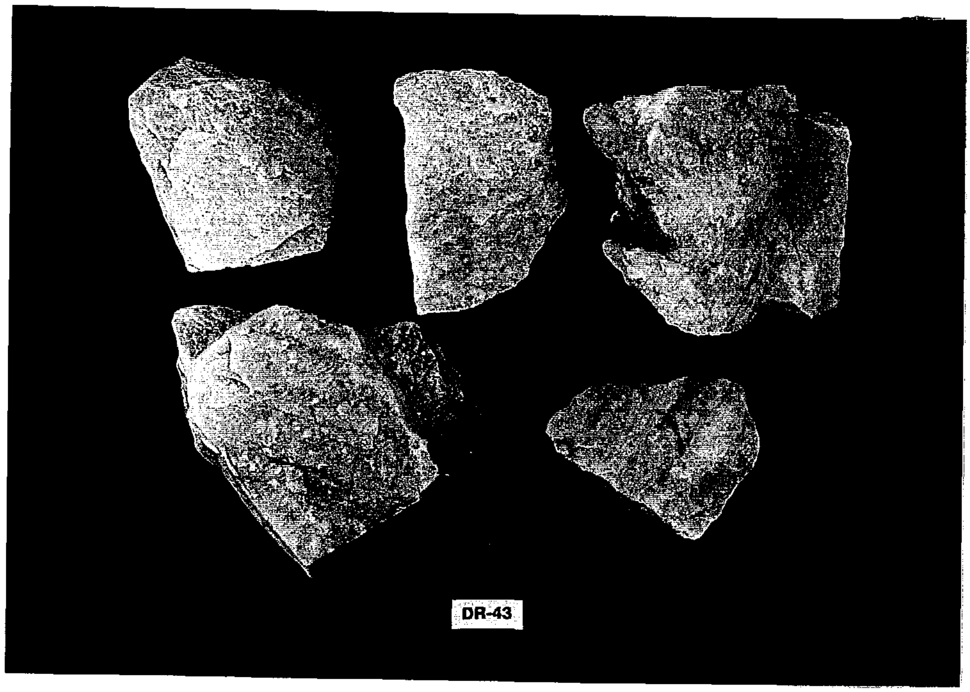


Figure 13.--Marble from one of the White quarries, sample DR43, Dragoon Mountains Unit. Specimen on bottom, left, is 3 in. across.

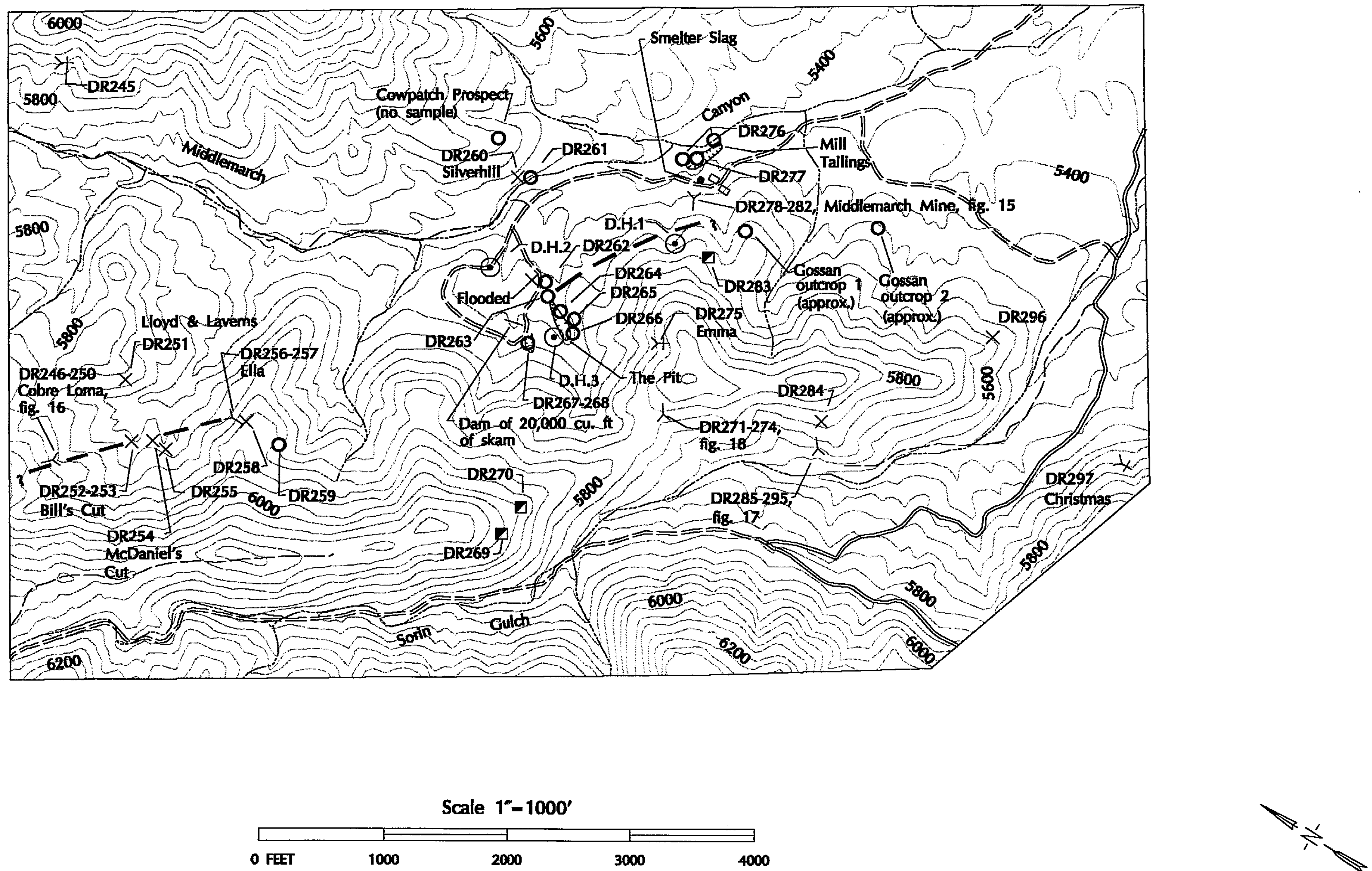


Figure 14.— Mines and prospects in Middlemarch Canyon, with sample localities DR 245-297, Dragoon Mountains Unit.

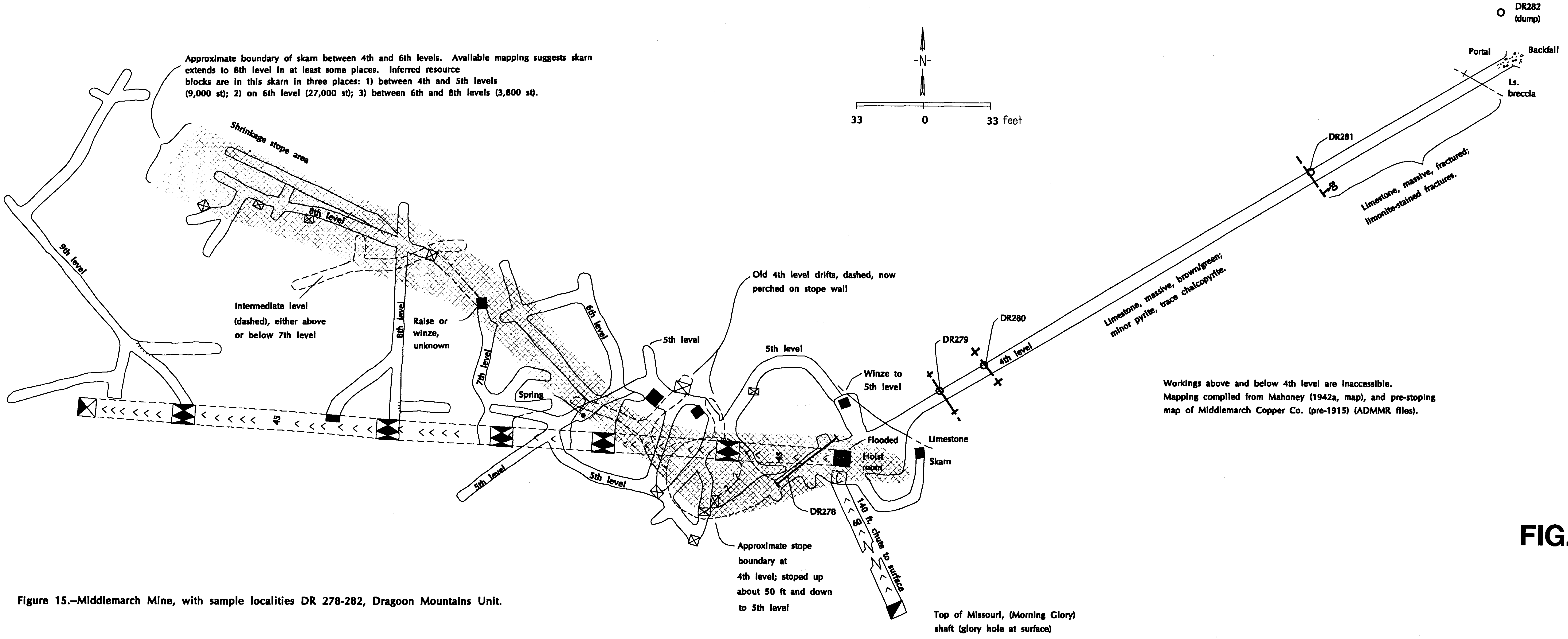


FIG. 15

Figure 15.–Middlemarch Mine, with sample localities DR 278-282, Dragoon Mountains Unit.

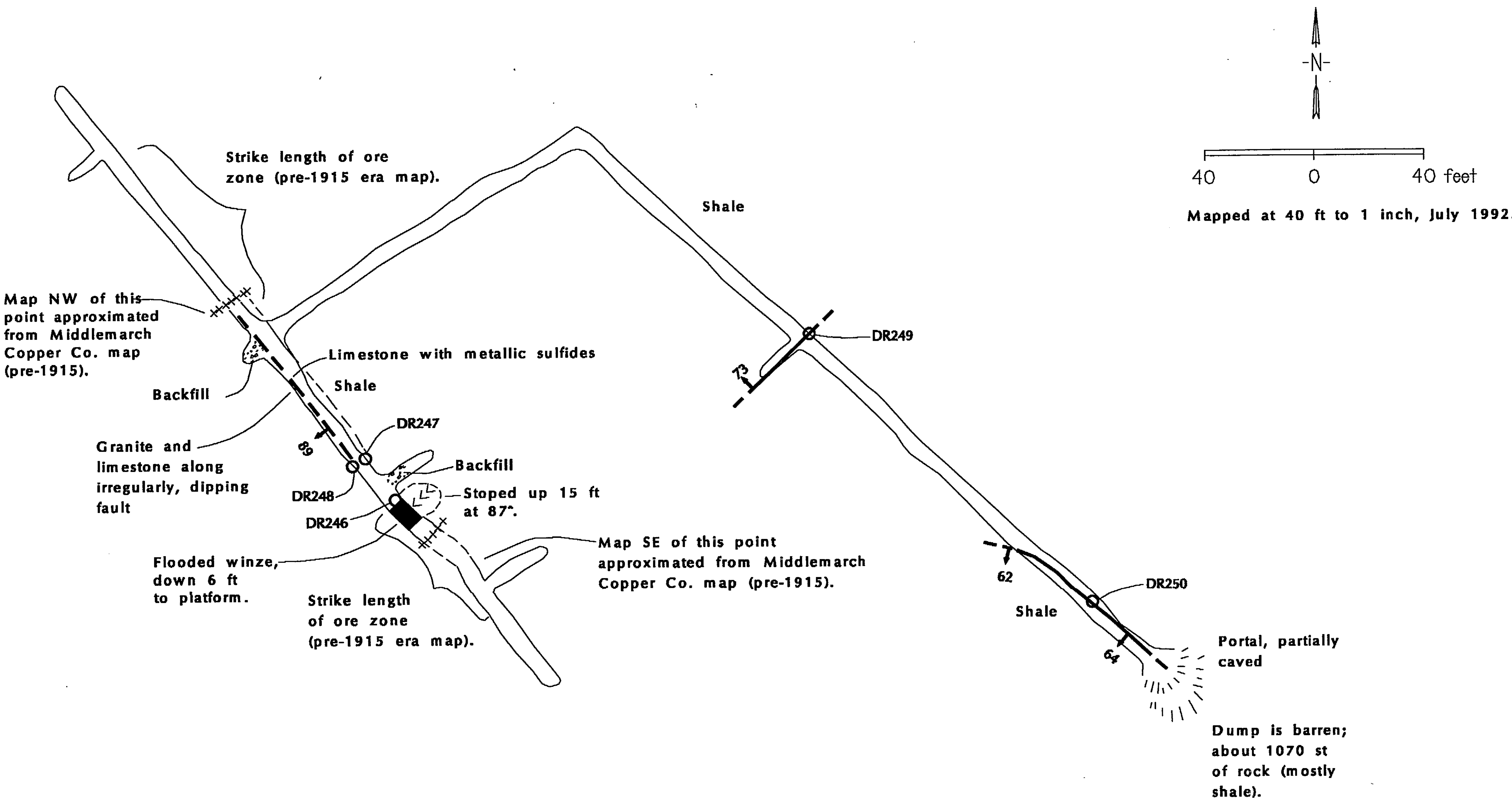
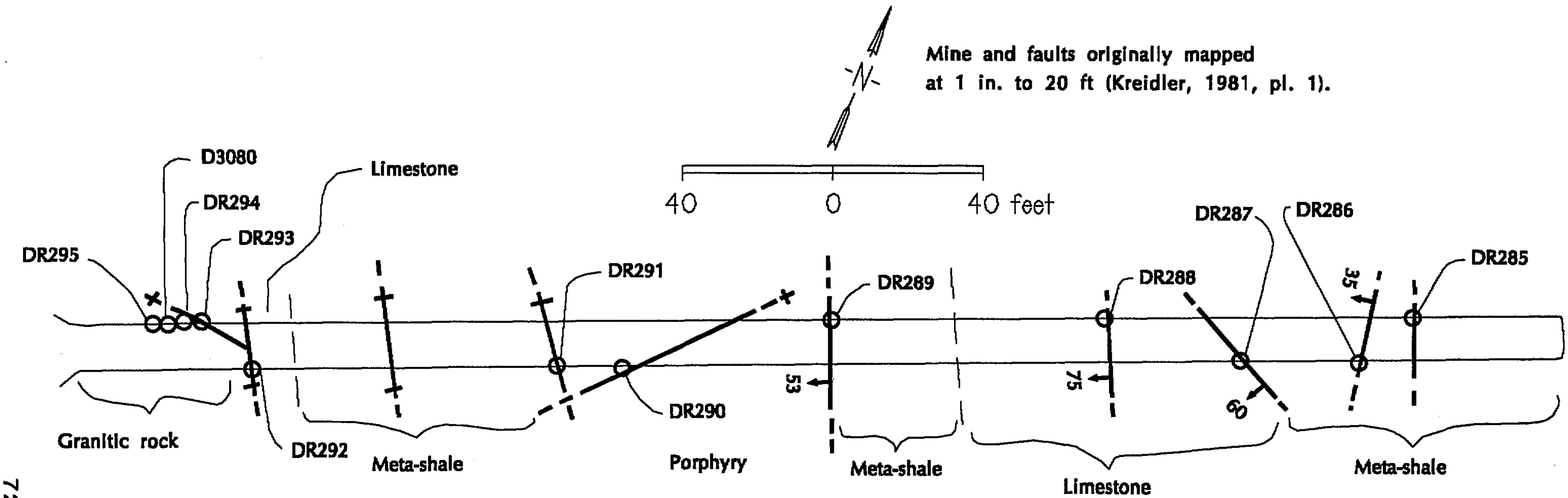


Figure 16.--Cobre Loma Mine, with sample localities DR 246-250, Dragoon Mountains Unit.



Geology from Anaconda Geol. Document Collection, "Middlemarch South tunnel" map (1956), with location of carbonates from Kreidler (1981, pl. 1).

Figure 17.—"South adit", with sample localities DR 285-295 and D3080, Dragoon Mountains Unit.

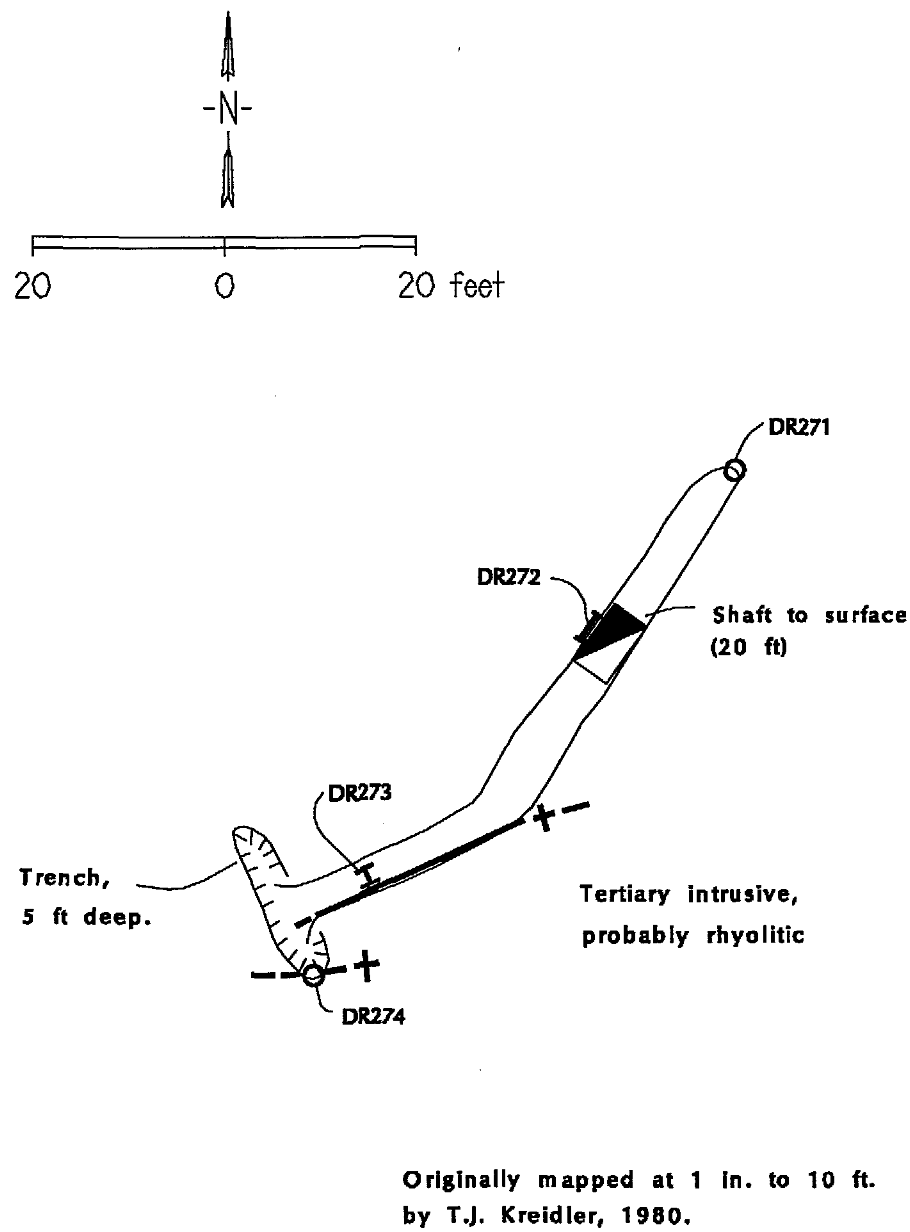
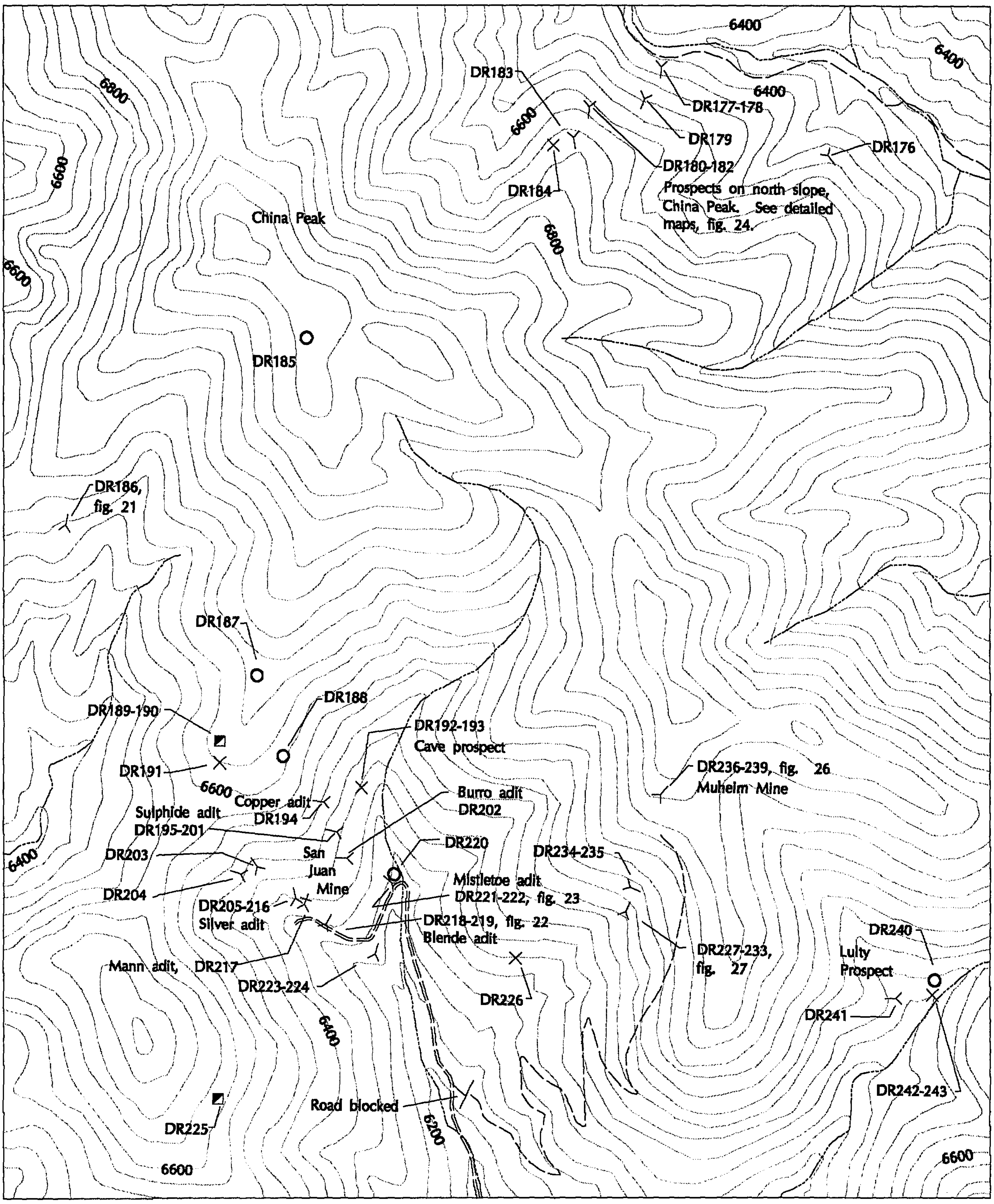


Figure 18.-- Unnamed prospect adit, with sample localities DR 271-274, Dragoon Mountains Unit.



See detailed San Juan Mine map (Silver, Sulphide, Mann adits), fig. 20.

Scale 1"=500'

0 FEET 500 1000 1500 2000

-N-

Figure 19.– San Juan and Muheim Mines, and nearby prospects, with sample localities DR 176-243, Dragoon Mountains Unit.

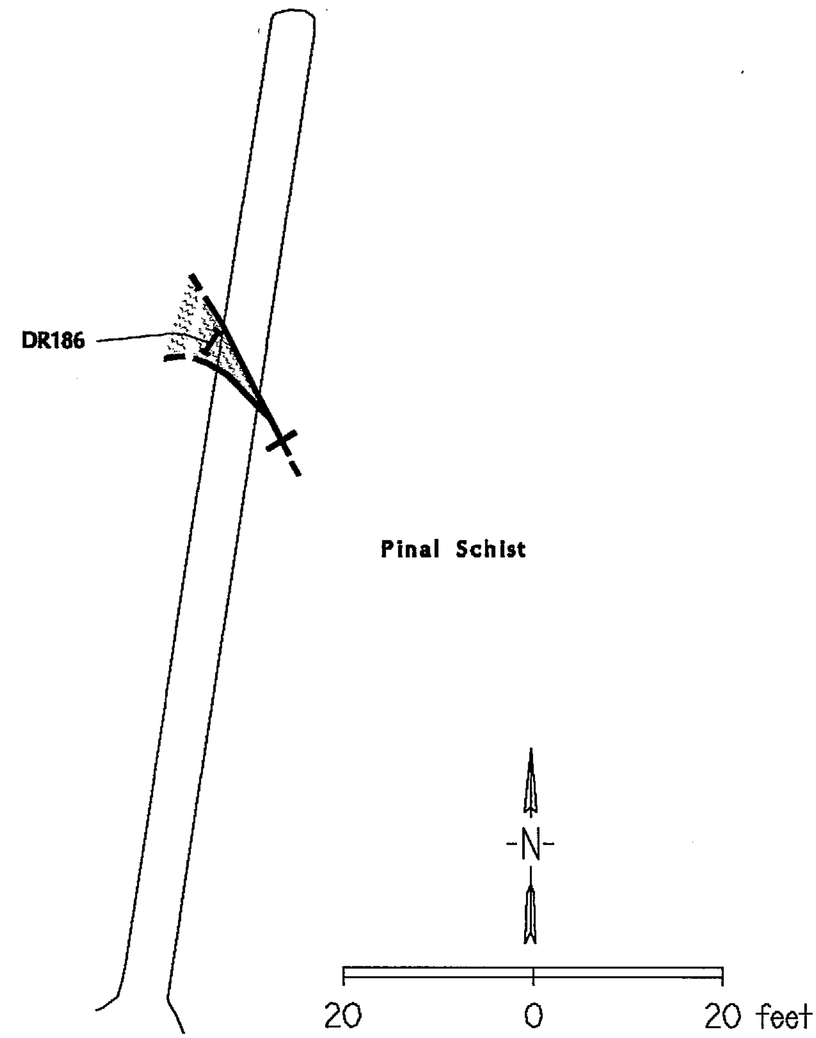


Figure 21.--Unnamed prospect adit in Precambrian rock, west of San Juan Mine, with sample locality DR 186, Dragoon Mountains Unit.

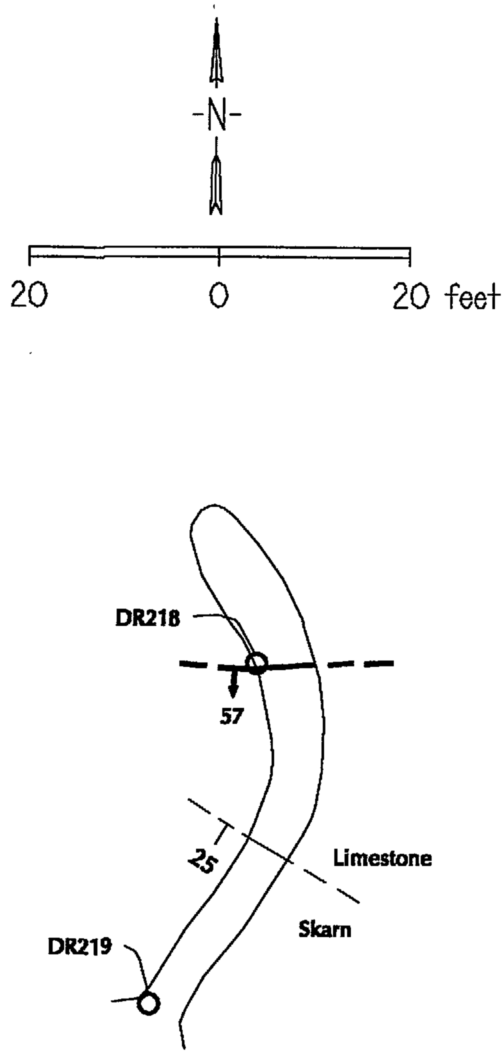


Figure 22.--Blende adit, a prospect of the San Juan Mine area, with sample localities DR 218-219, Dragoon Mountains Unit.

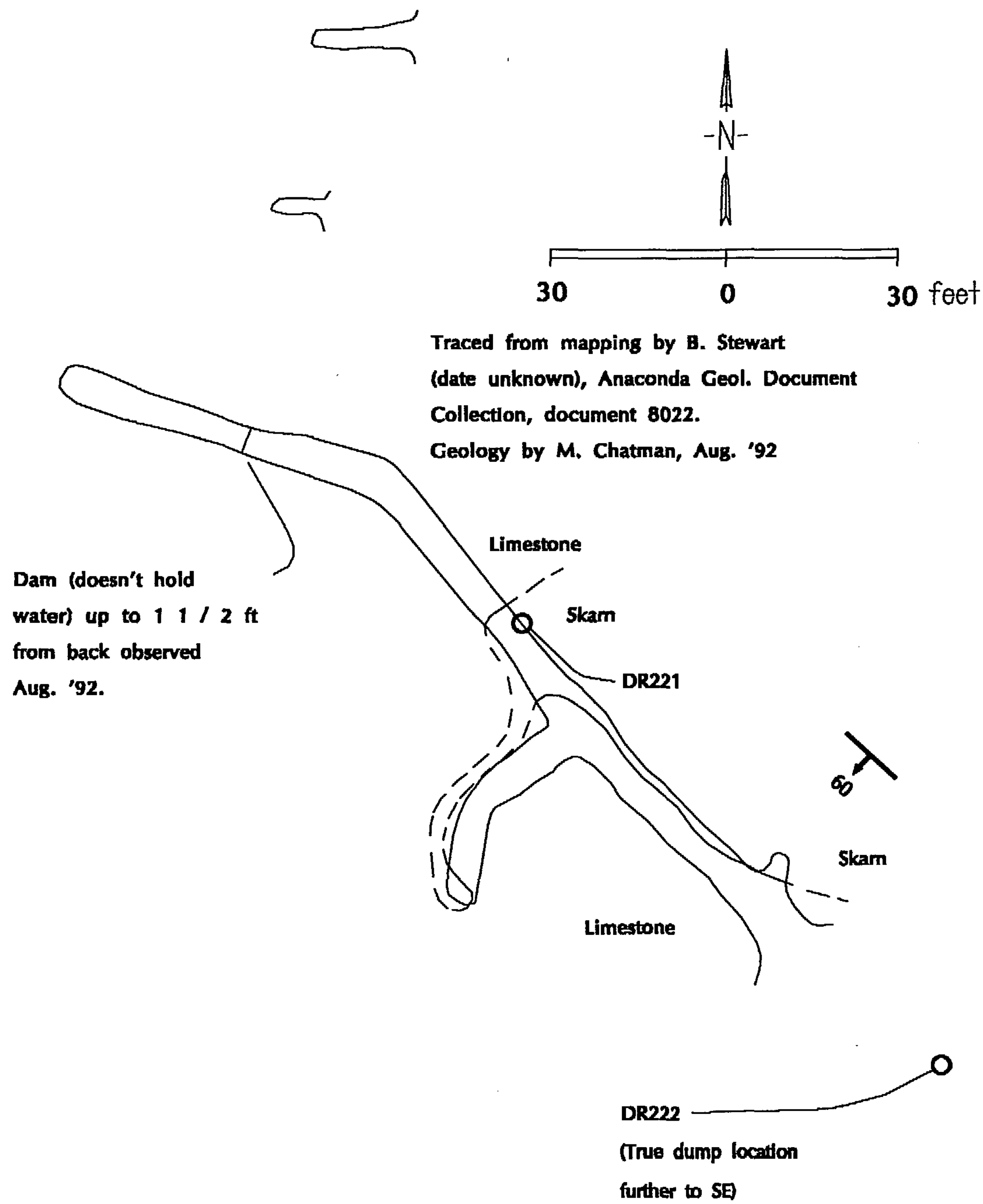


Figure 23.–Mistletoe adit with sample localities DR 221-222, Dragoon Mountains Unit.

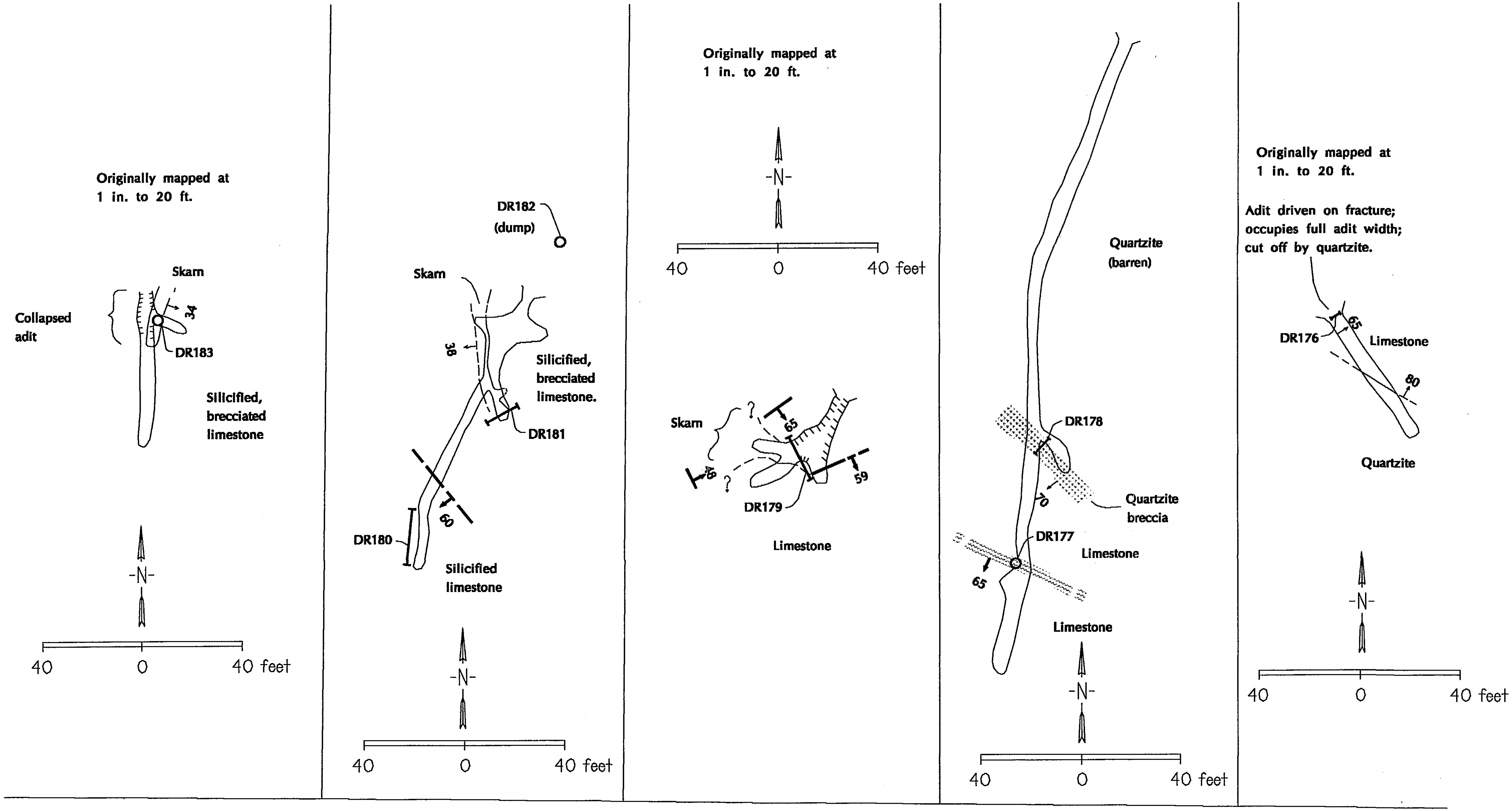


Figure 24.–Prospects on northeast slope of China Peak, with sample localities DR 176-183, Dragoon Mountains Unit.

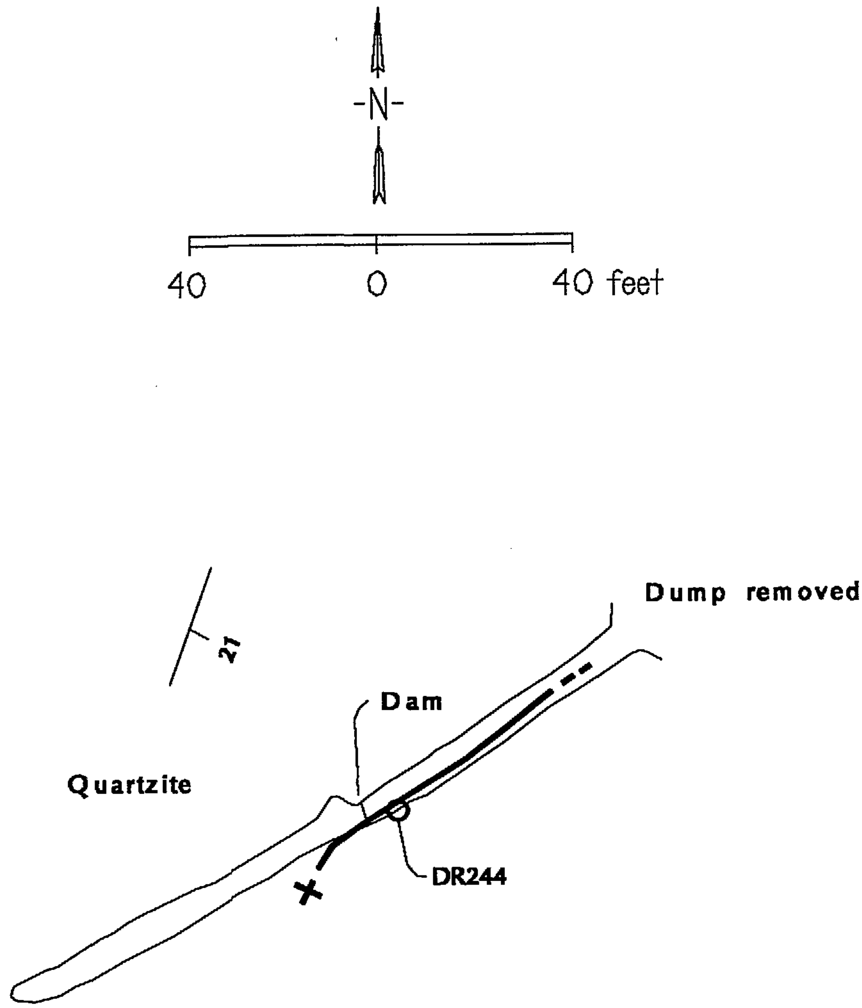
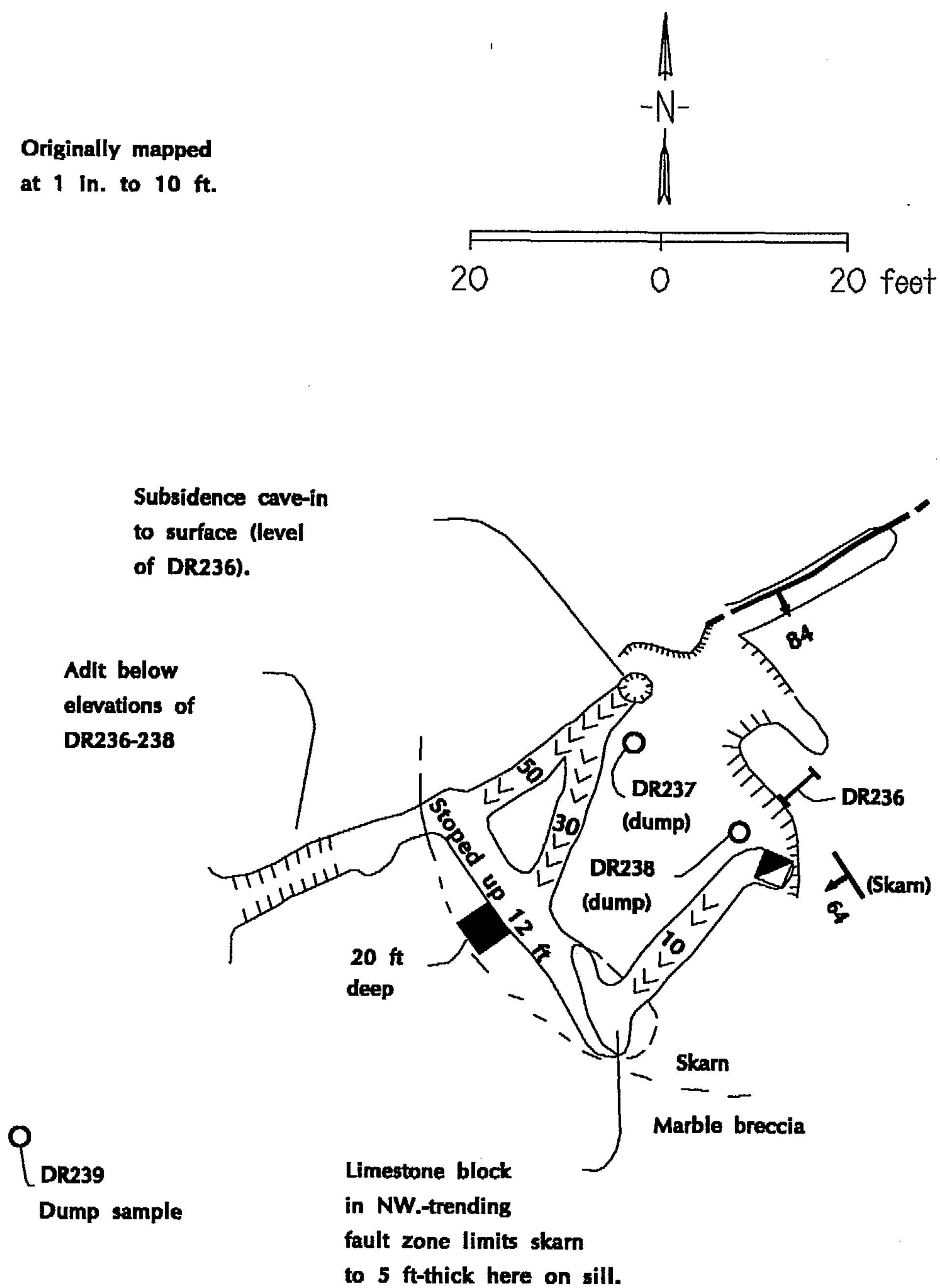


Figure 25.--Prospect adit north of Sorin Camp Mine, with sample locality DR 244, Dragoon Mountains Unit.



Note: bad back in lower adit, no safe place to sample

Figure 26.–Muheim mine, with sample localities
DR 236-239, Dragoon Mountains Unit.

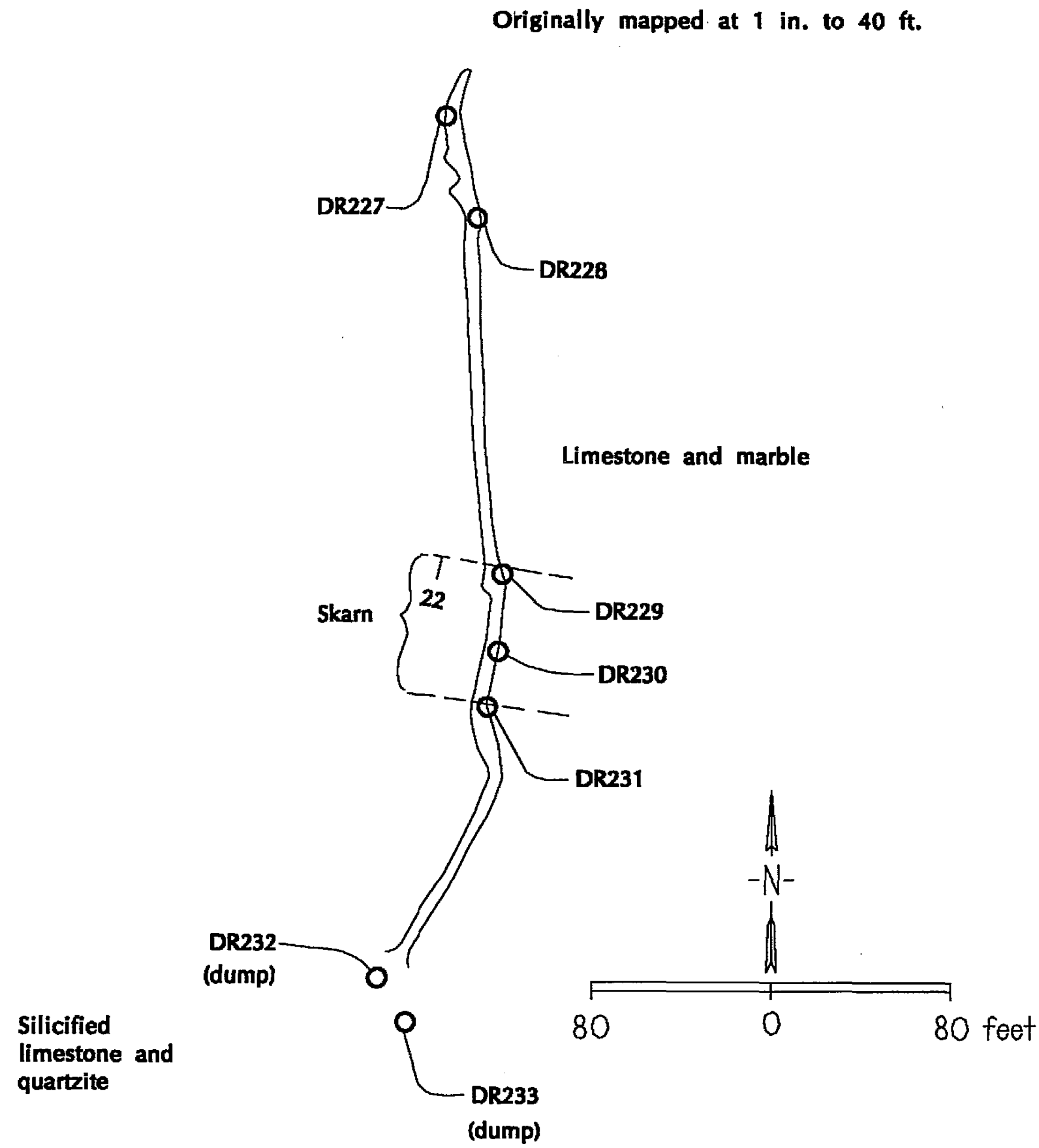
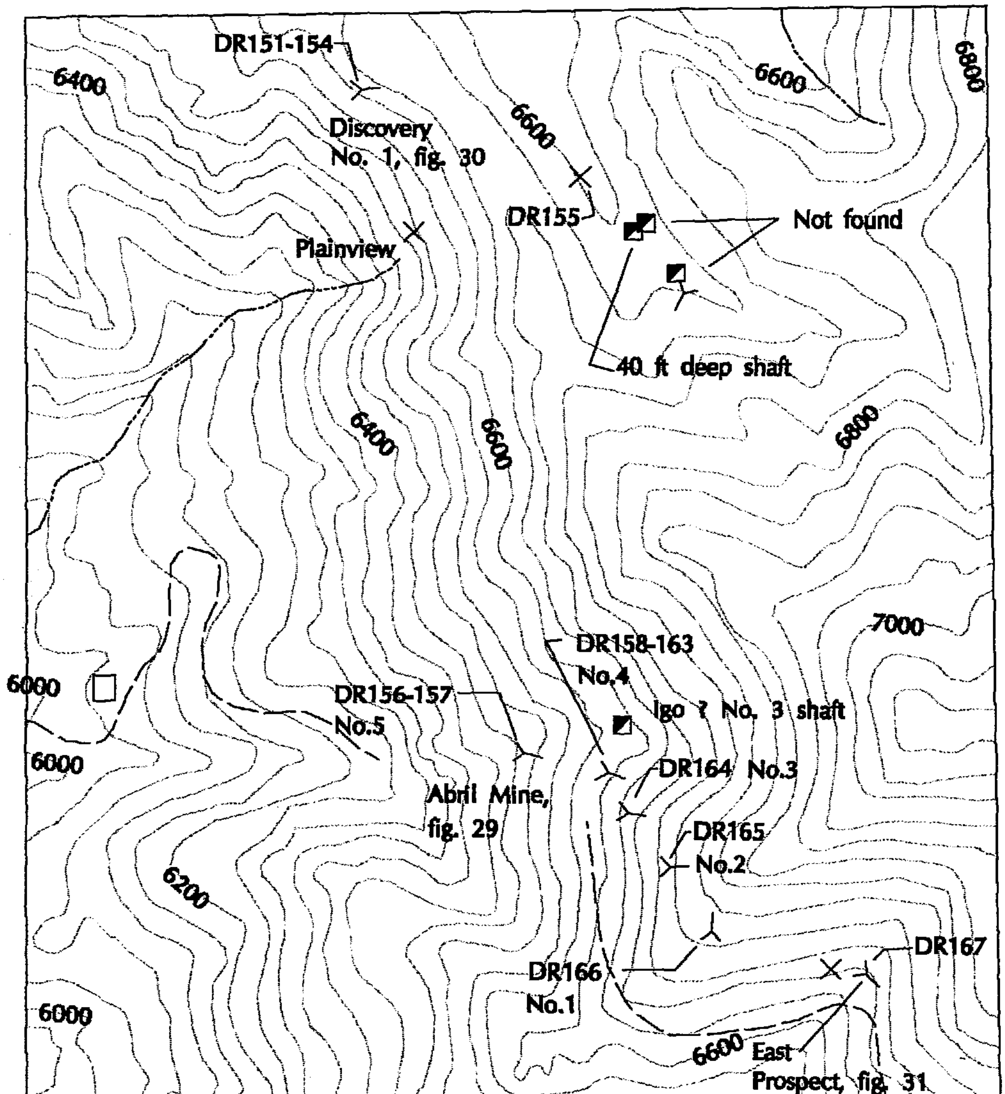


Figure 27.--Prospect adit on Muheim Mine property, with sample localities DR 227-233, Dragoon Mountains Unit.



Plainview location from Perry (1964, pl.); prospects 600 ft east of Plainview (not found) from Anaconda Geol. Document Collection (doc. 131109, no date).

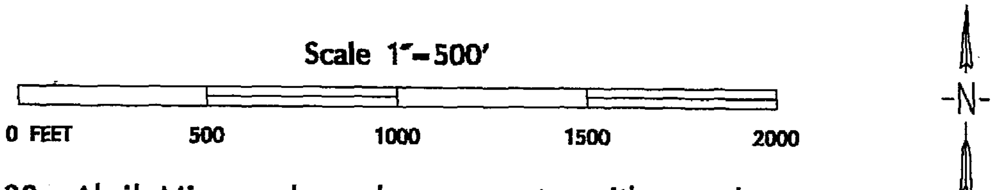


Figure 28.—Abril Mine and nearby prospects, with sample localities DR 151-167, Dragoon Mountains Unit.

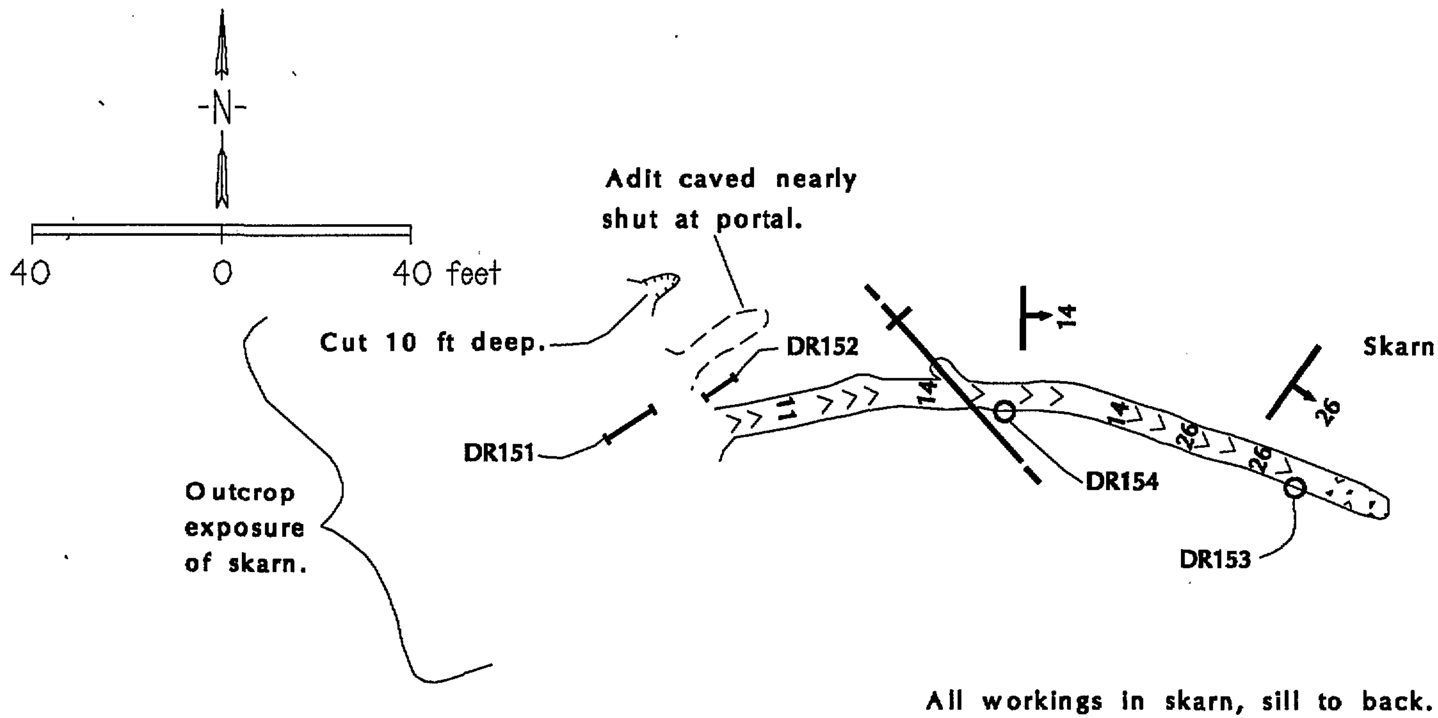


Figure 30.--Discovery no. 1 prospect, with sample localities DR 151-154, Dragoon Mountains Unit.

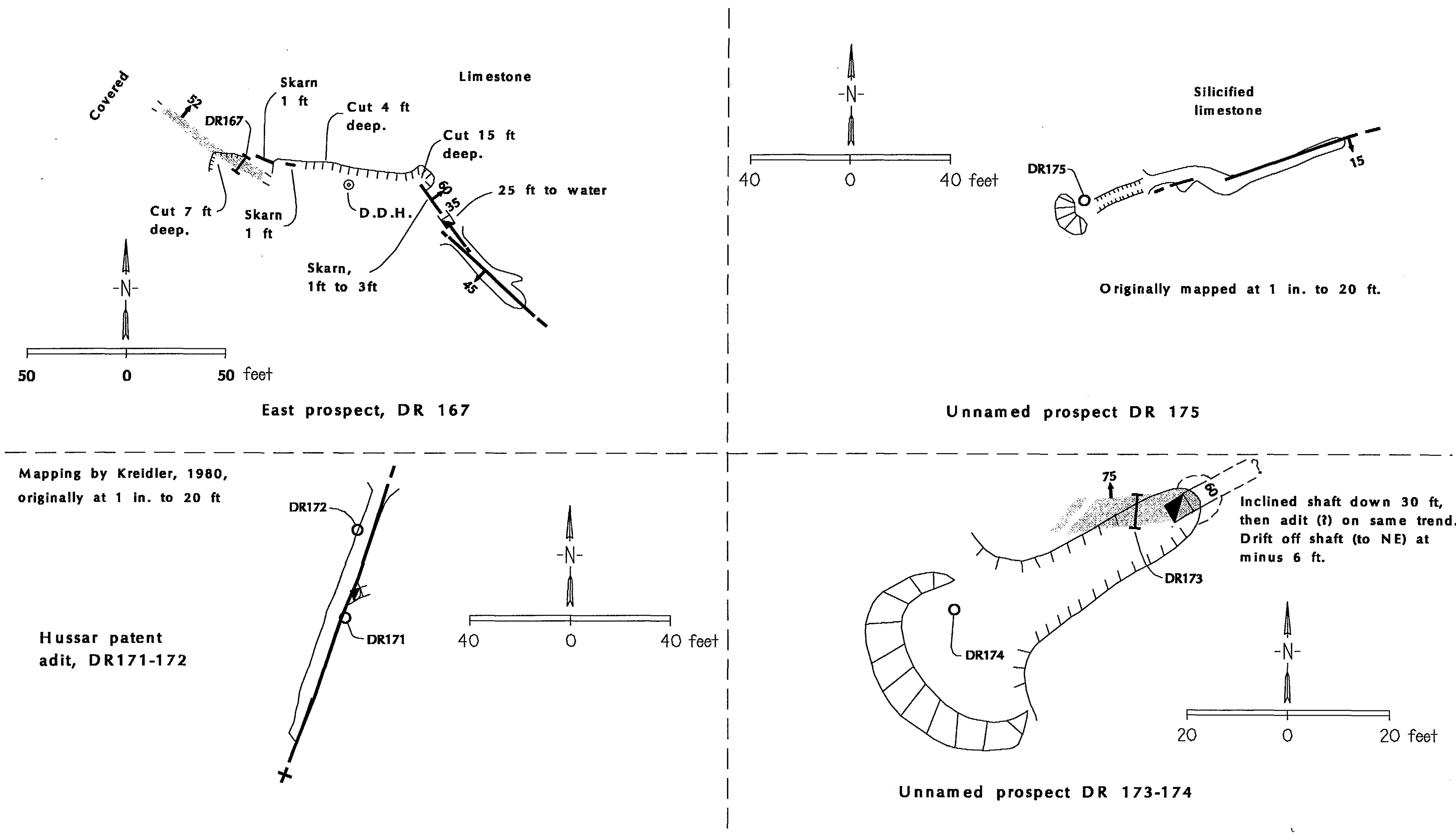


Figure 31.--Prospects on skarn to south of Abril Mine, with sample localities DR 167, 171-175, Dragoon Mountains Unit.

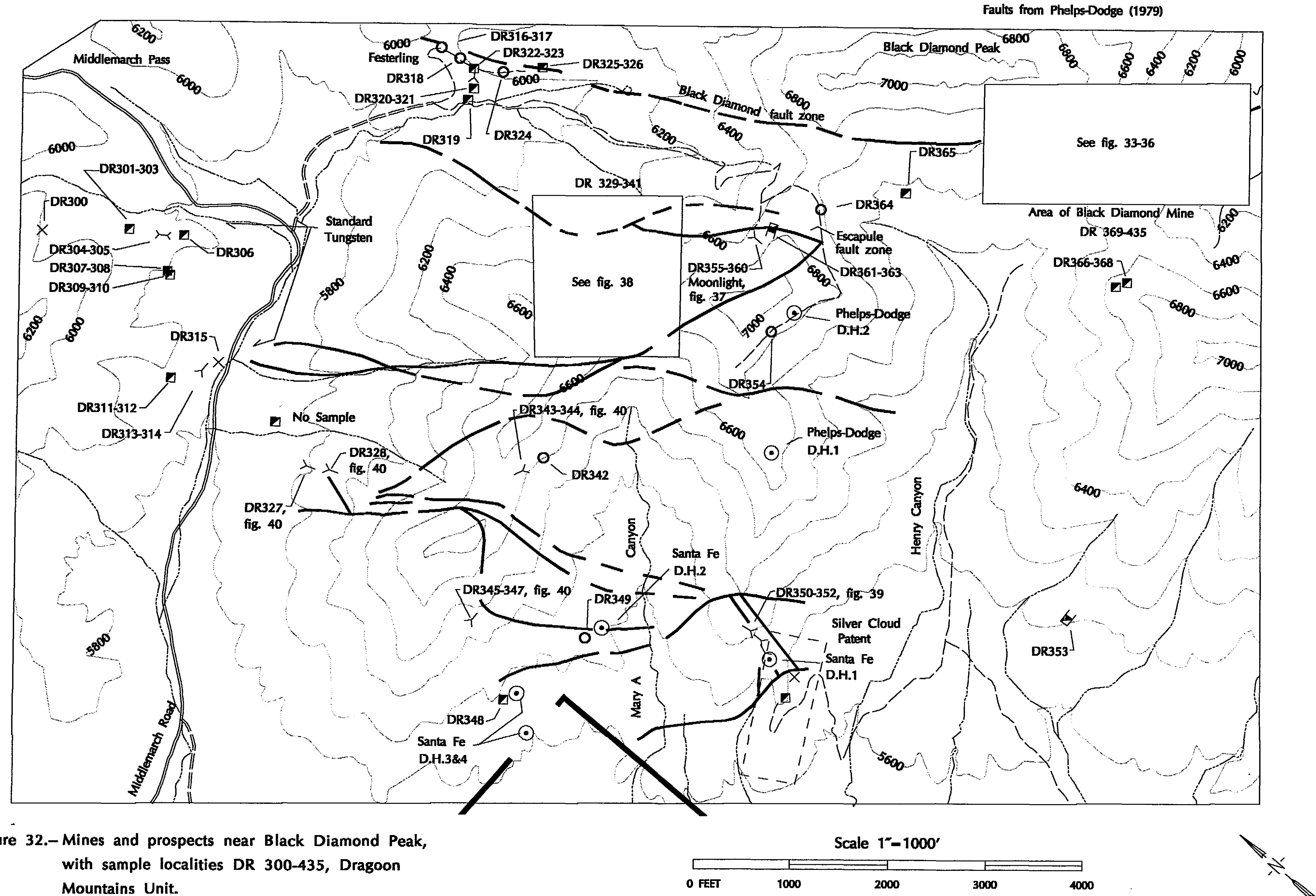
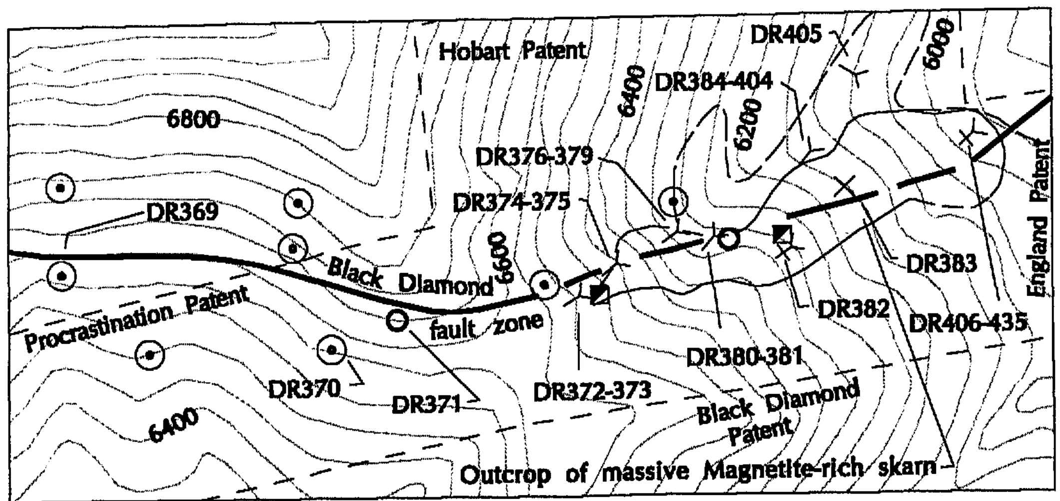


Figure 32.– Mines and prospects near Black Diamond Peak, with sample localities DR 300-435, Dragoon Mountains Unit.



See detailed mine maps, fig. 36 (DR372-382); fig. 35 (DR384-404); fig.34 (DR406-435).

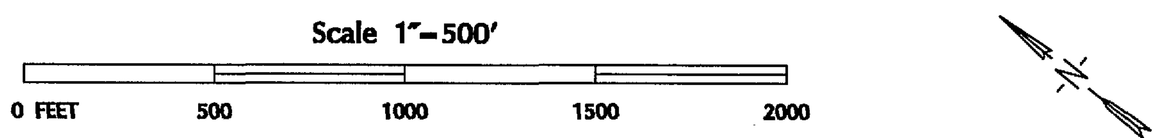


Figure 33.– Black Diamond Mine, with sample localities DR 369-435, Dragoon Mountains Unit.

FIG. 34

Figure34.–Black Diamond Mine, Bagge level, with sample localities DR 406-435, Dragoon Mountains Unit.

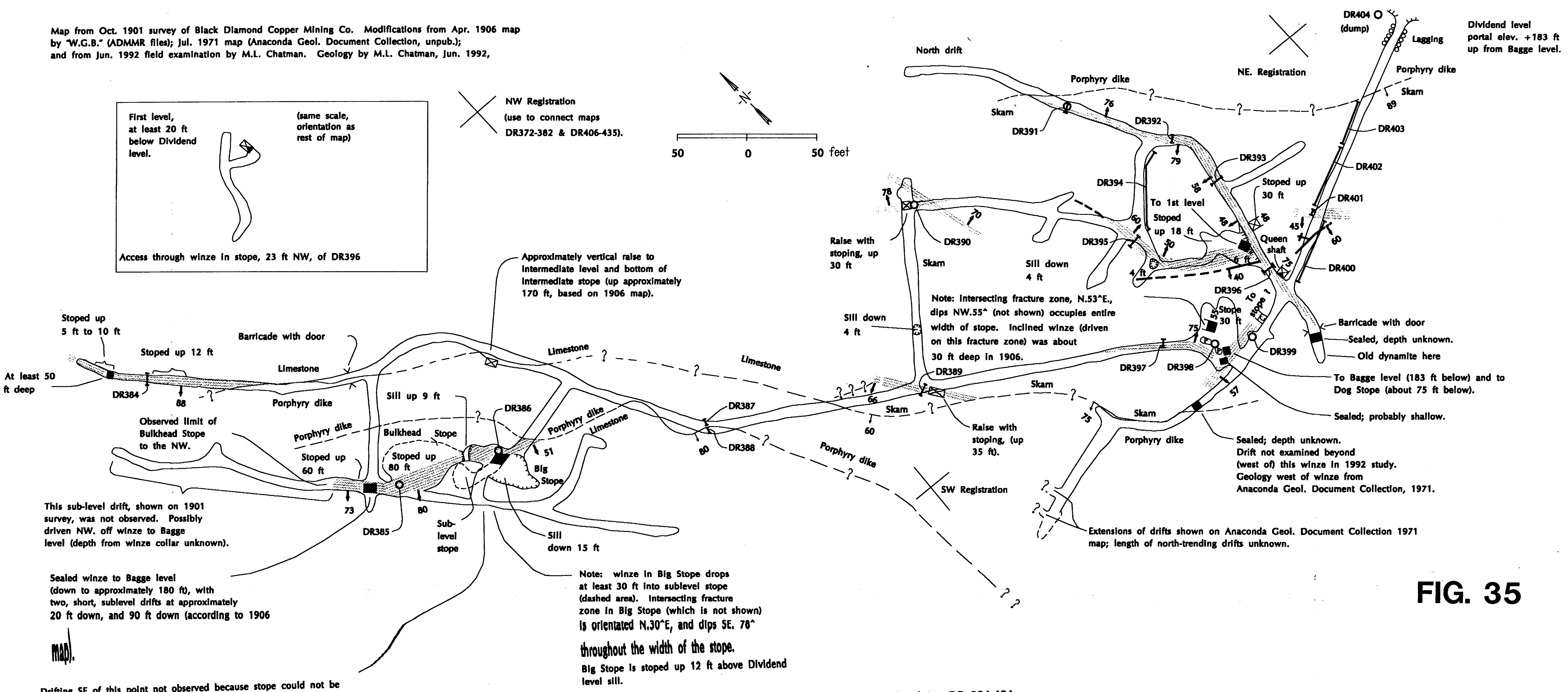


FIG. 35

Figure 35.–Black Diamond Mine, Dividend level, and First level, with sample localities DR 384-404, Dragoon Mountains Unit.

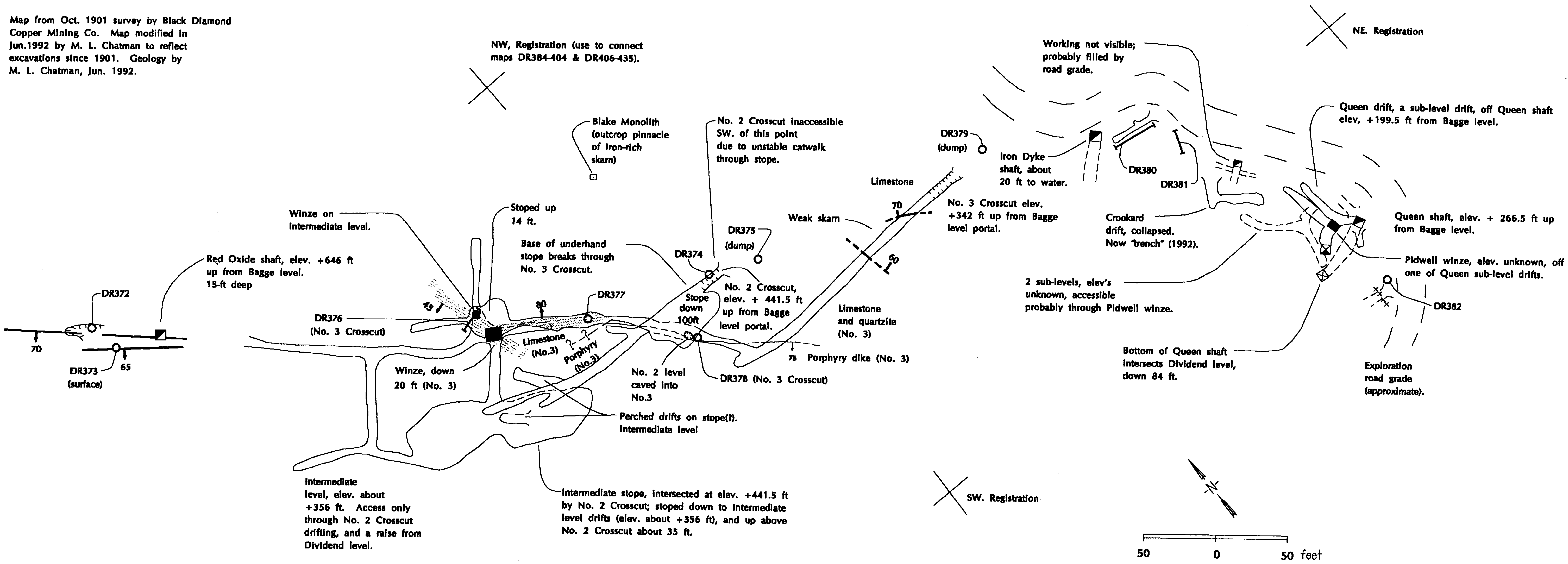


FIG. 36

Figure 36.–Black Diamond Mine, upper levels, including Intermediate level, No. 3 Crosscut, No. 2 Crosscut, Queen levels Crookard drift, and small prospects and shafts, with sample localities DR 372-382, Dragoon Mountains Unit.

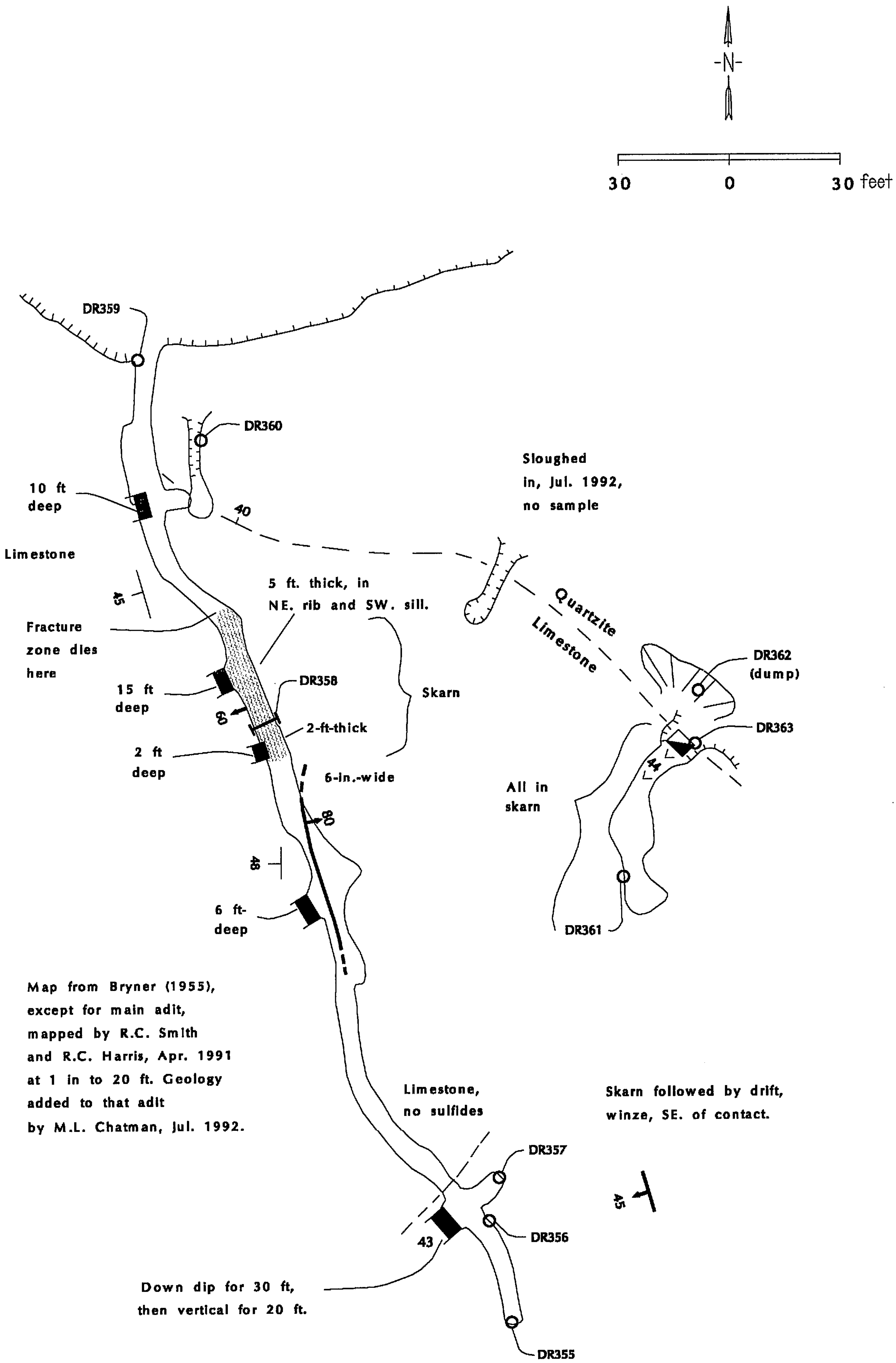


Figure 37.--Moonlight Mine, with sample localities DR 355-363, Dragoon Mountains Unit.

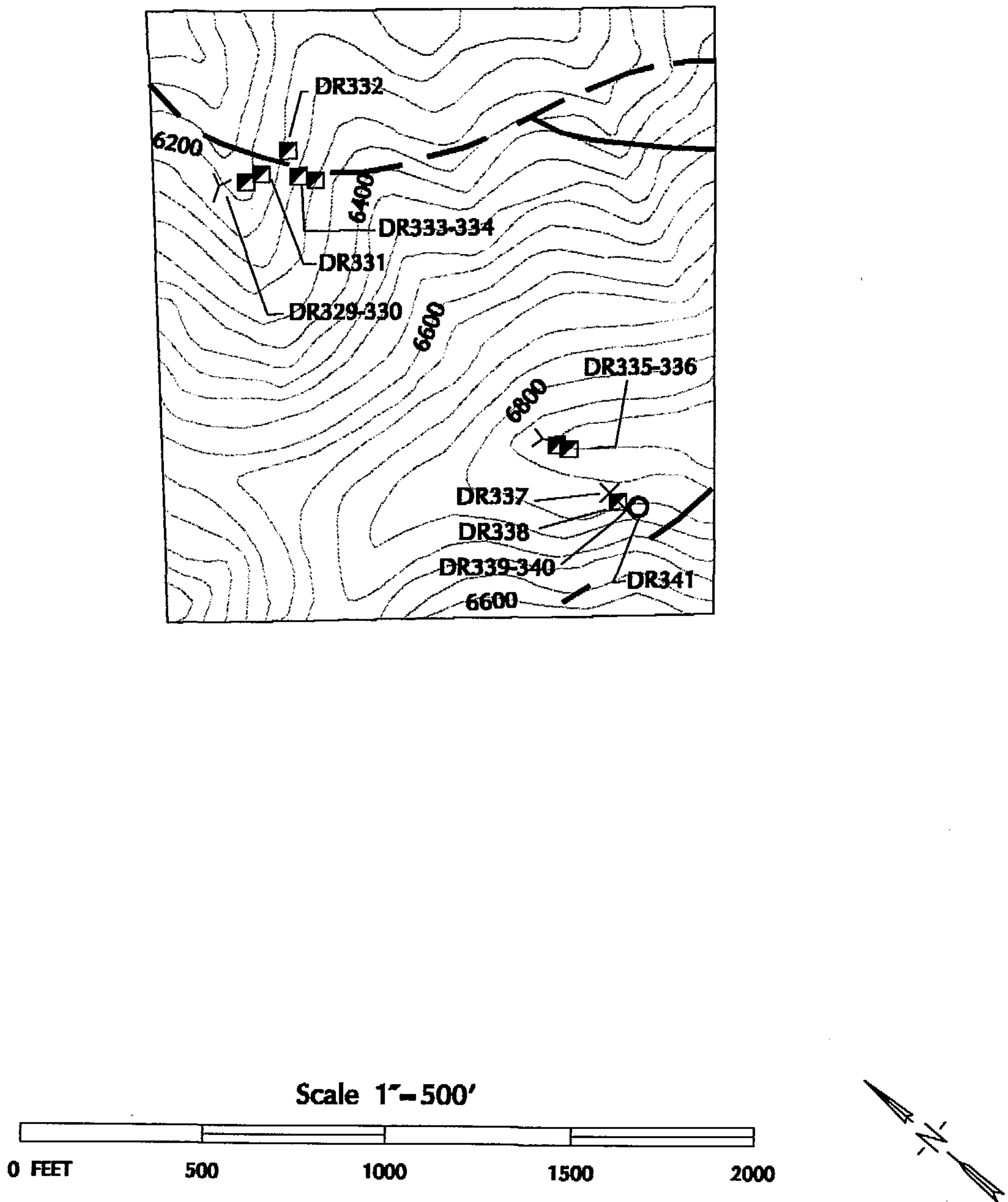


Figure 38.– Prospects northwest of the Moonlight Mine, with sample localities DR 329-341, Dragoon Mountains Unit.

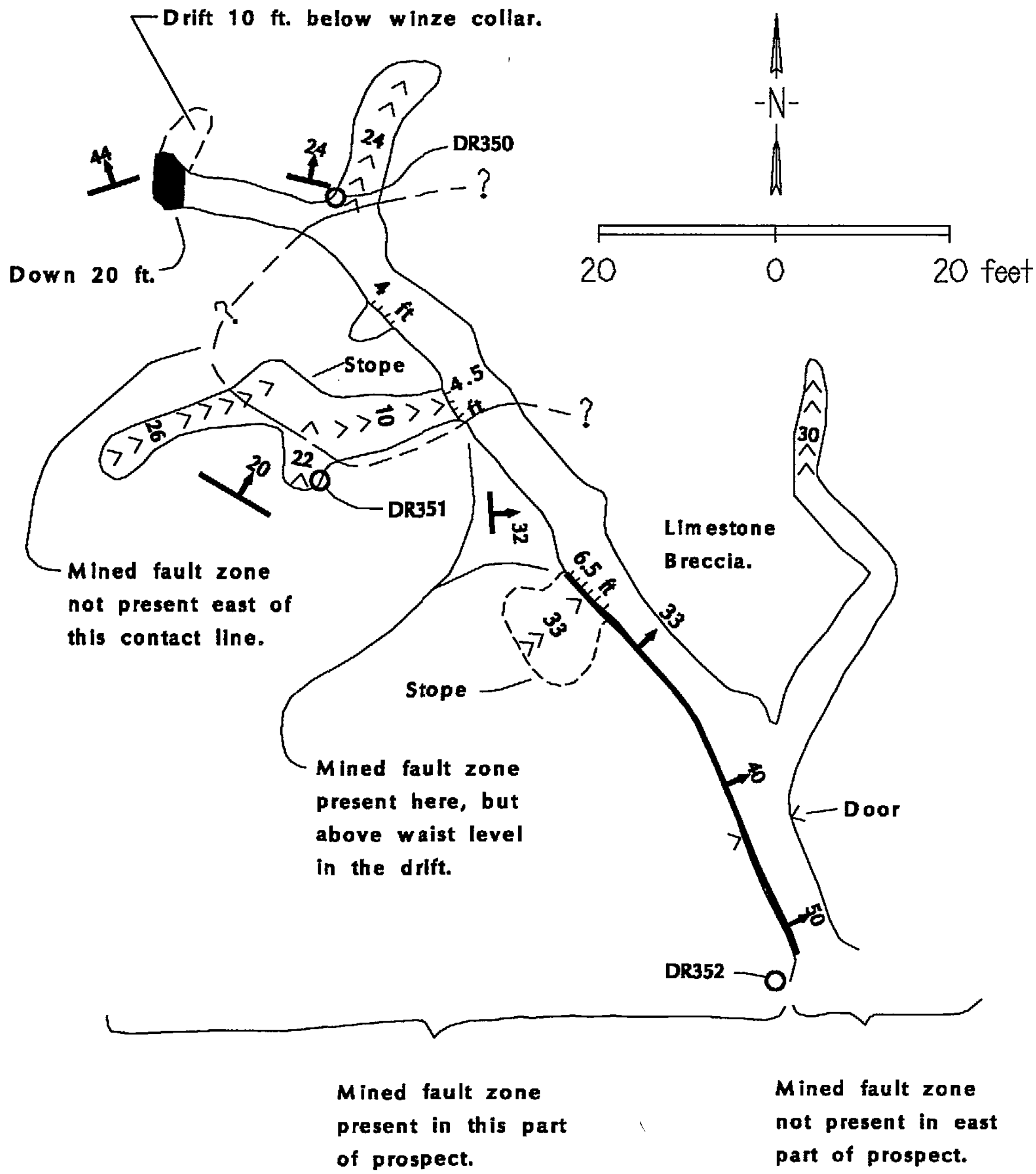


Figure 39.--Prospect north of Silver Cloud patent, with sample localities DR 350-352, Dragoon Mountains Unit.

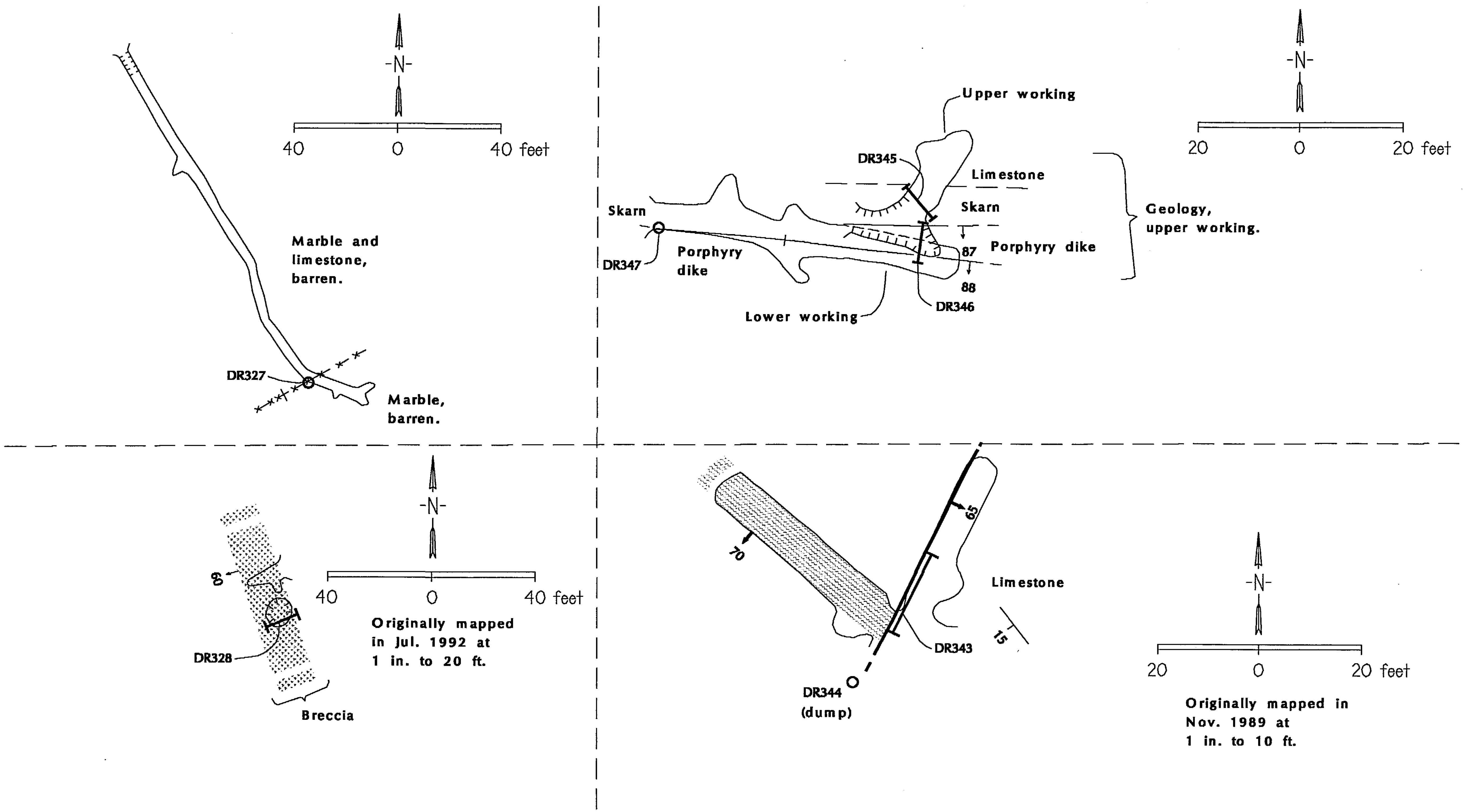


Figure 40.--Prospects on north-trending fault zones, north of Silver Cloud patent, with sample localities DR 327-328, DR 343-347, Dragoon Mountains Unit.

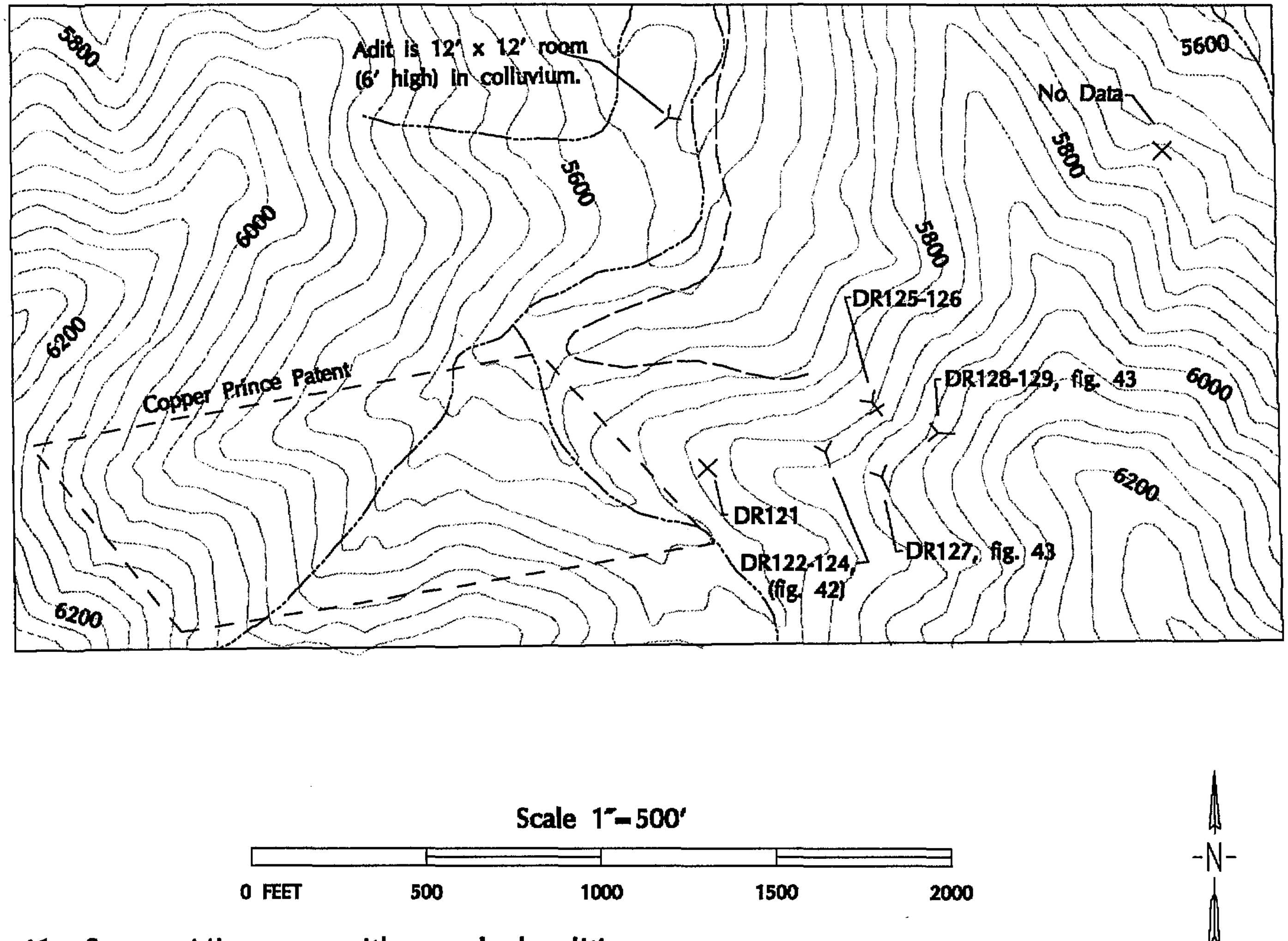


Figure 41.—Seneca Mine area with sample localities DR 121-129, Dragoon Mountains Unit.

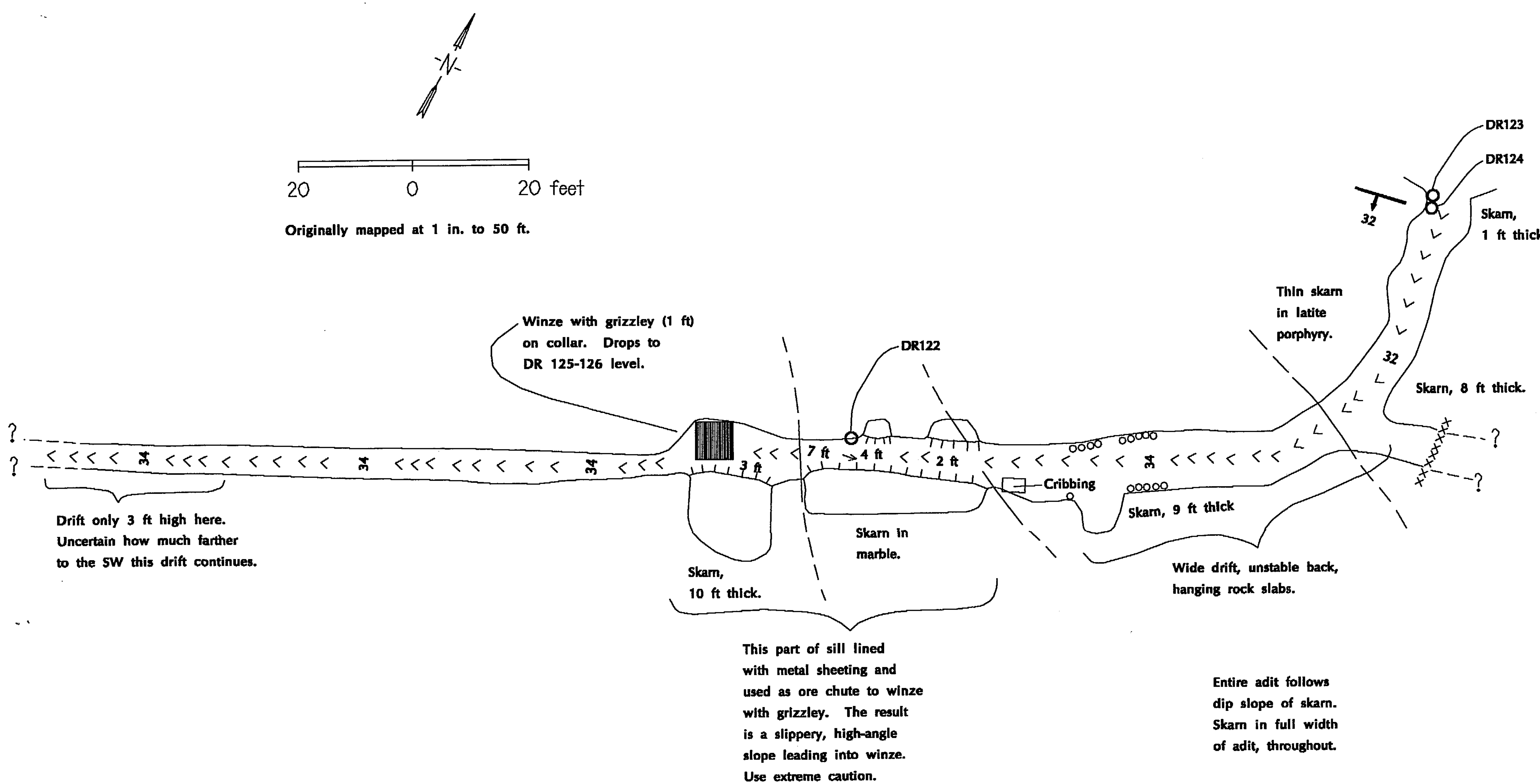


Figure 42.–Part of Seneca Mine, adit with sample localities DR 122-124, Dragoon Mountains Unit.

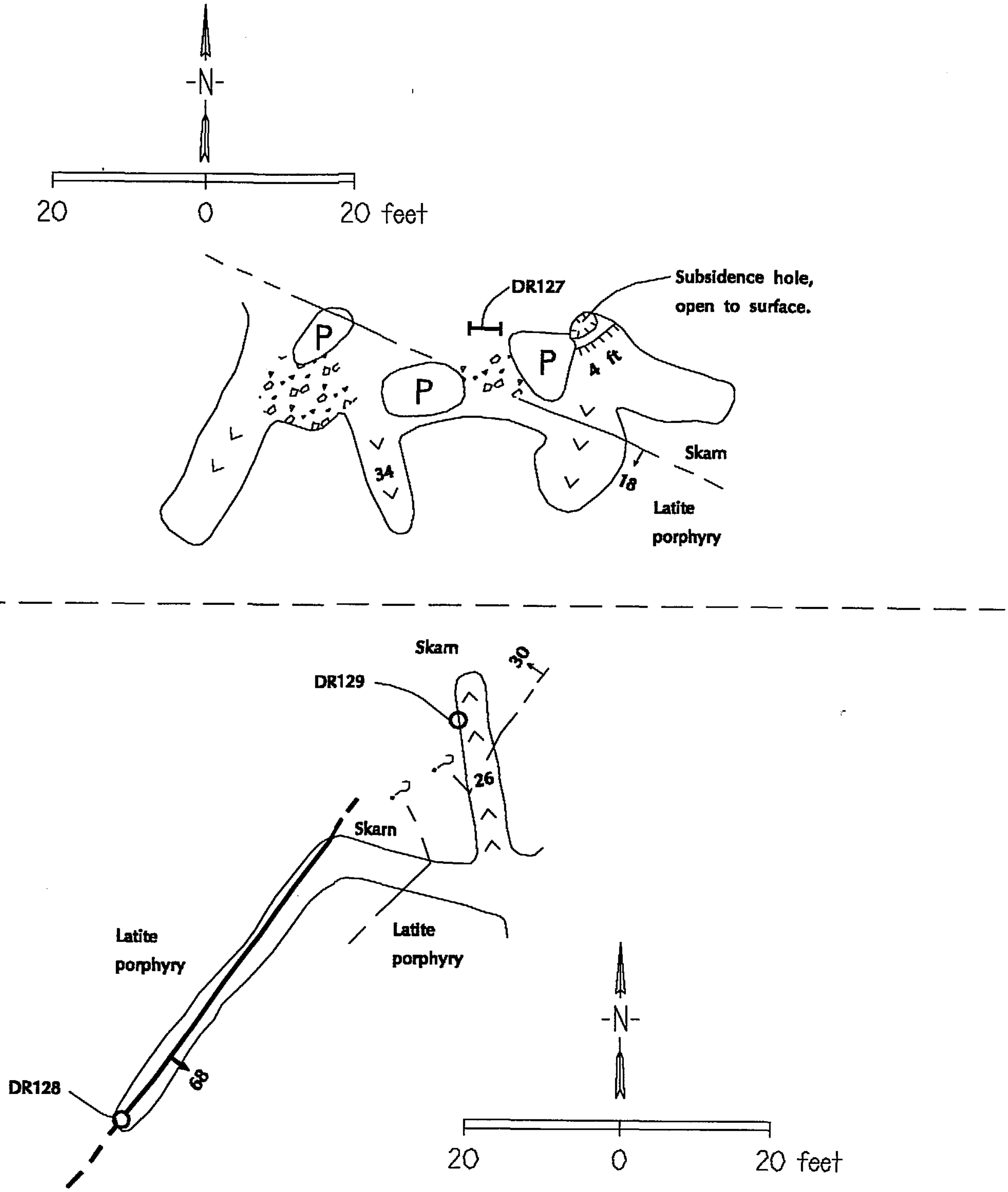


Figure 43.--Part of Seneca Mine, adits with sample localities DR 127 and DR 128-129, Dragoon Mountains Unit.

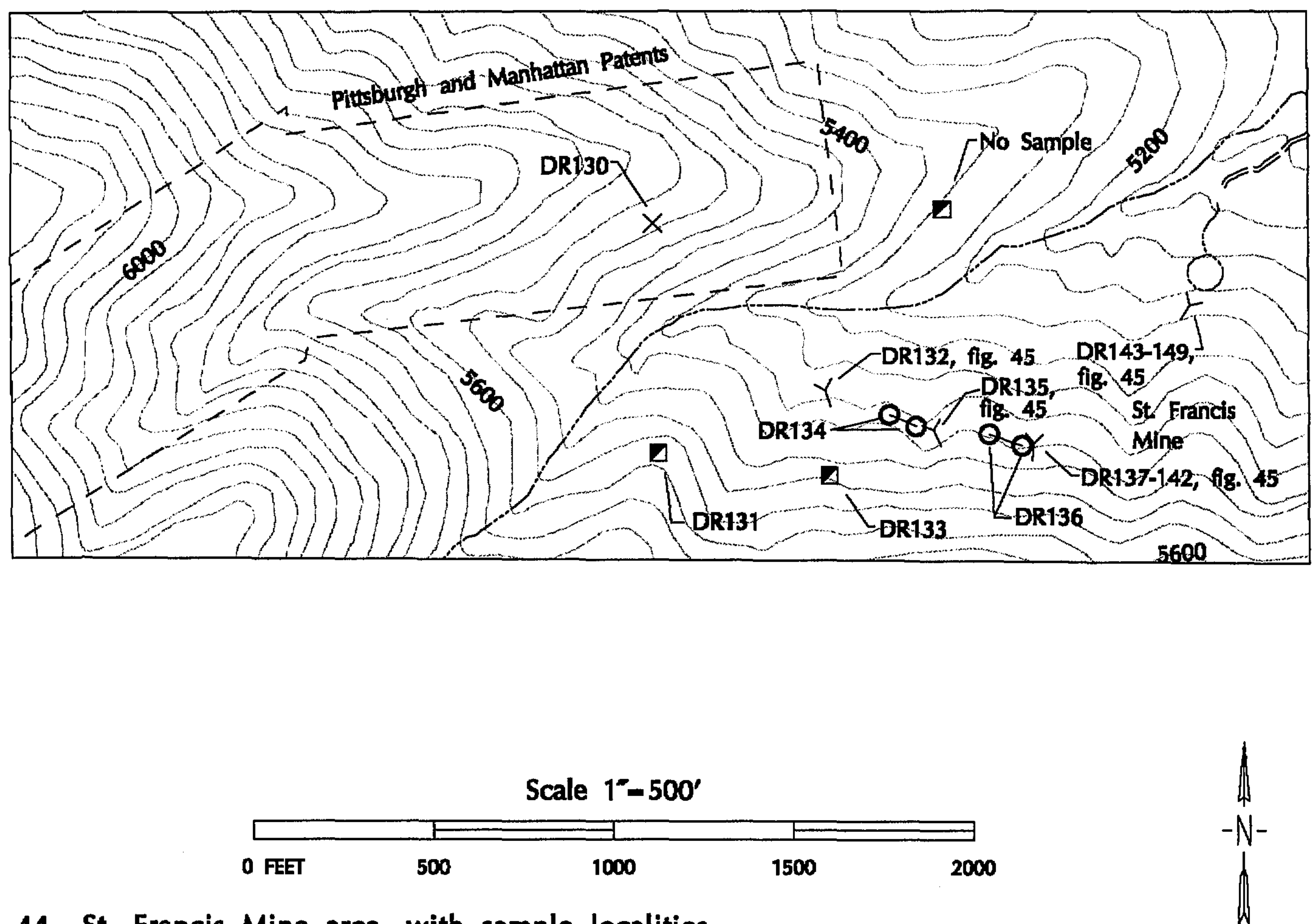


Figure 44.—St. Francis Mine area, with sample localities DR 130-149, Dragoon Mountains Unit.

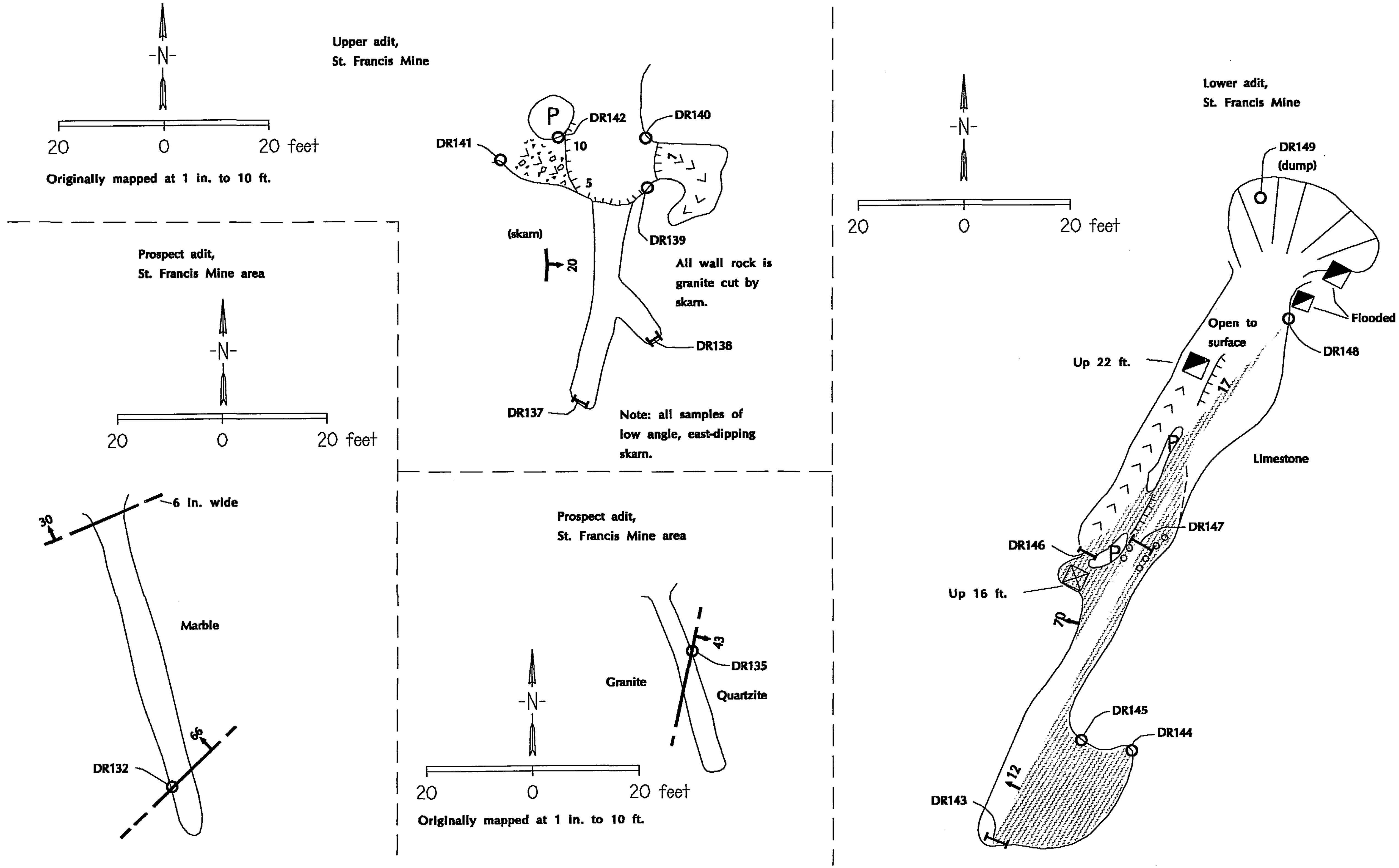


Figure 45.–St. Francis Mine and nearby prospect adits, with sample localities DR 132, DR 135, DR 137-149, Dragoon Mountains Unit.

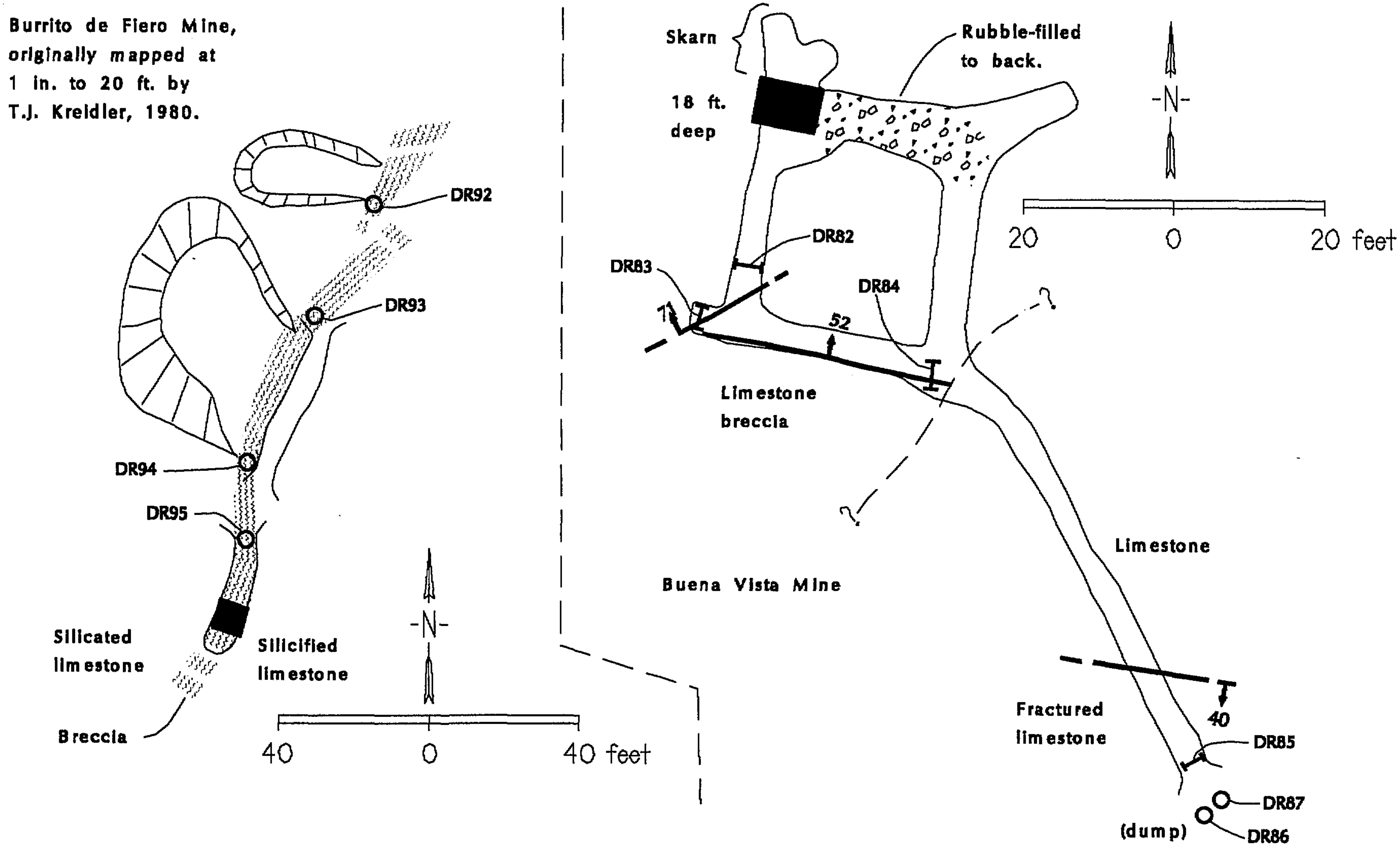


Figure 46.--Burrito de Fiero Mine (DR 92-95) and Buena Vista Mine (DR 82-87), Dragoon Mountains Unit.

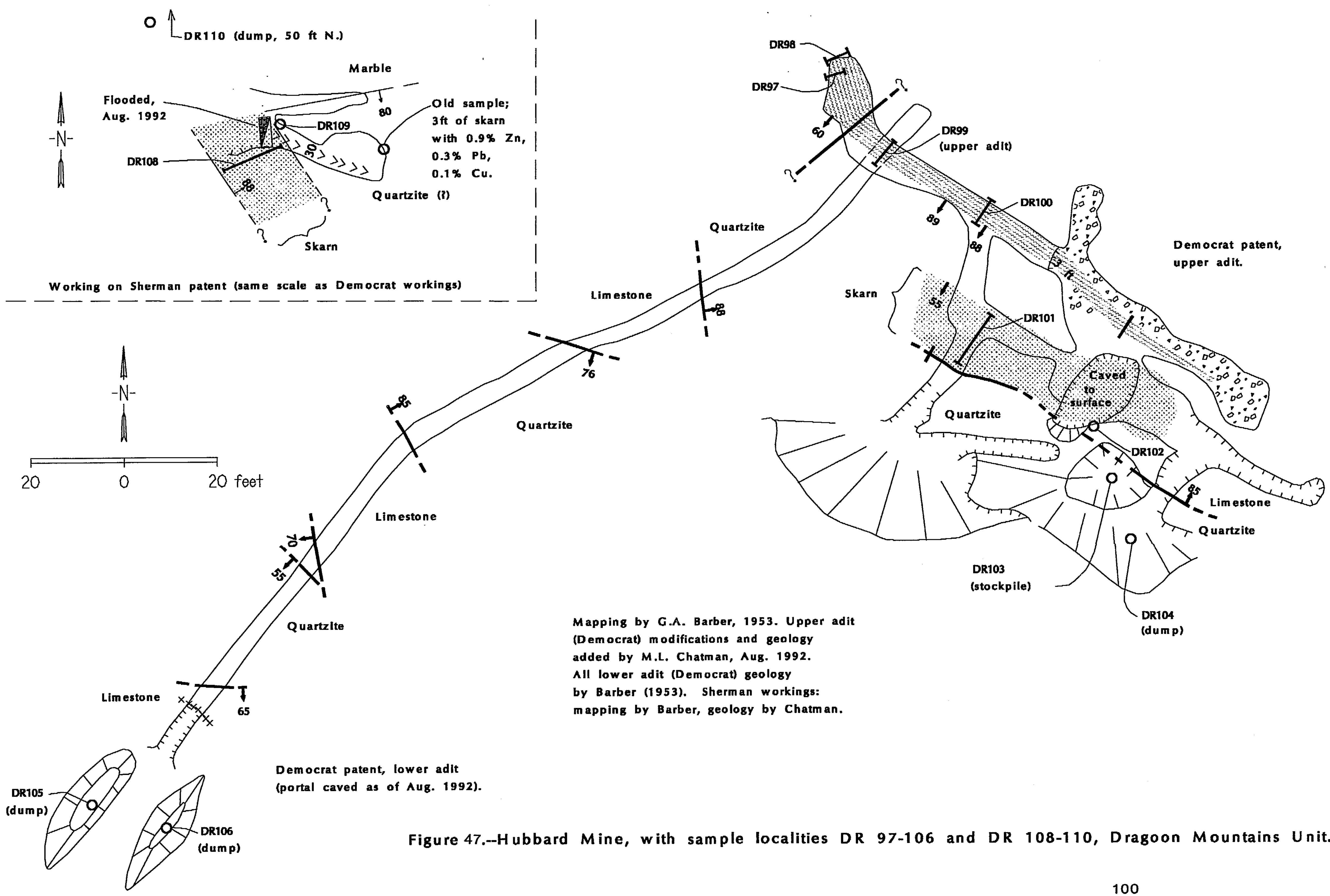


Figure 47.--Hubbard Mine, with sample localities DR 97-106 and DR 108-110, Dragoon Mountains Unit.

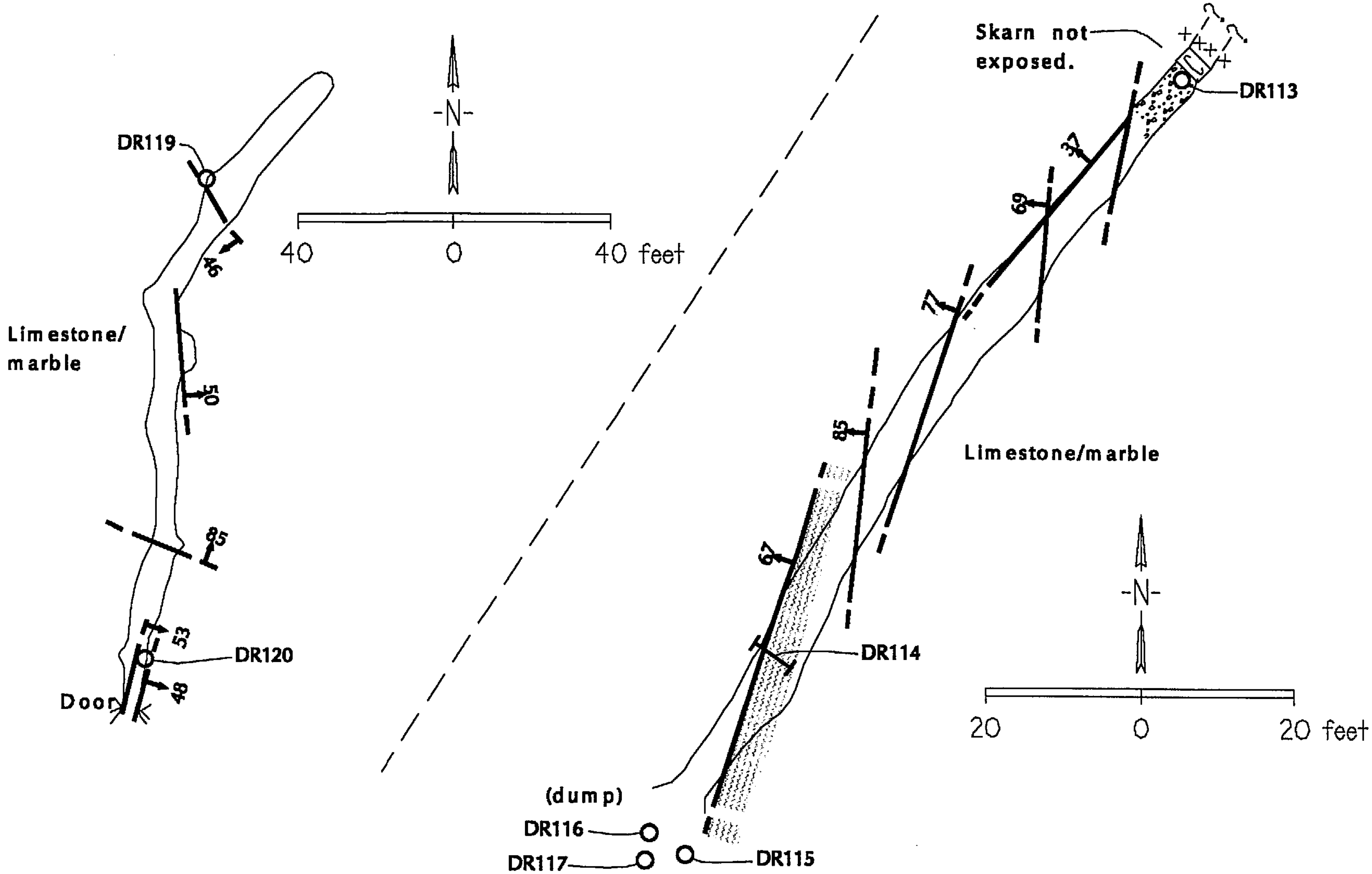


Figure 48.--Naoe claims, two largest adits, with sample localities DR 113-117, DR 119-120, Dragoon Mountains Unit.

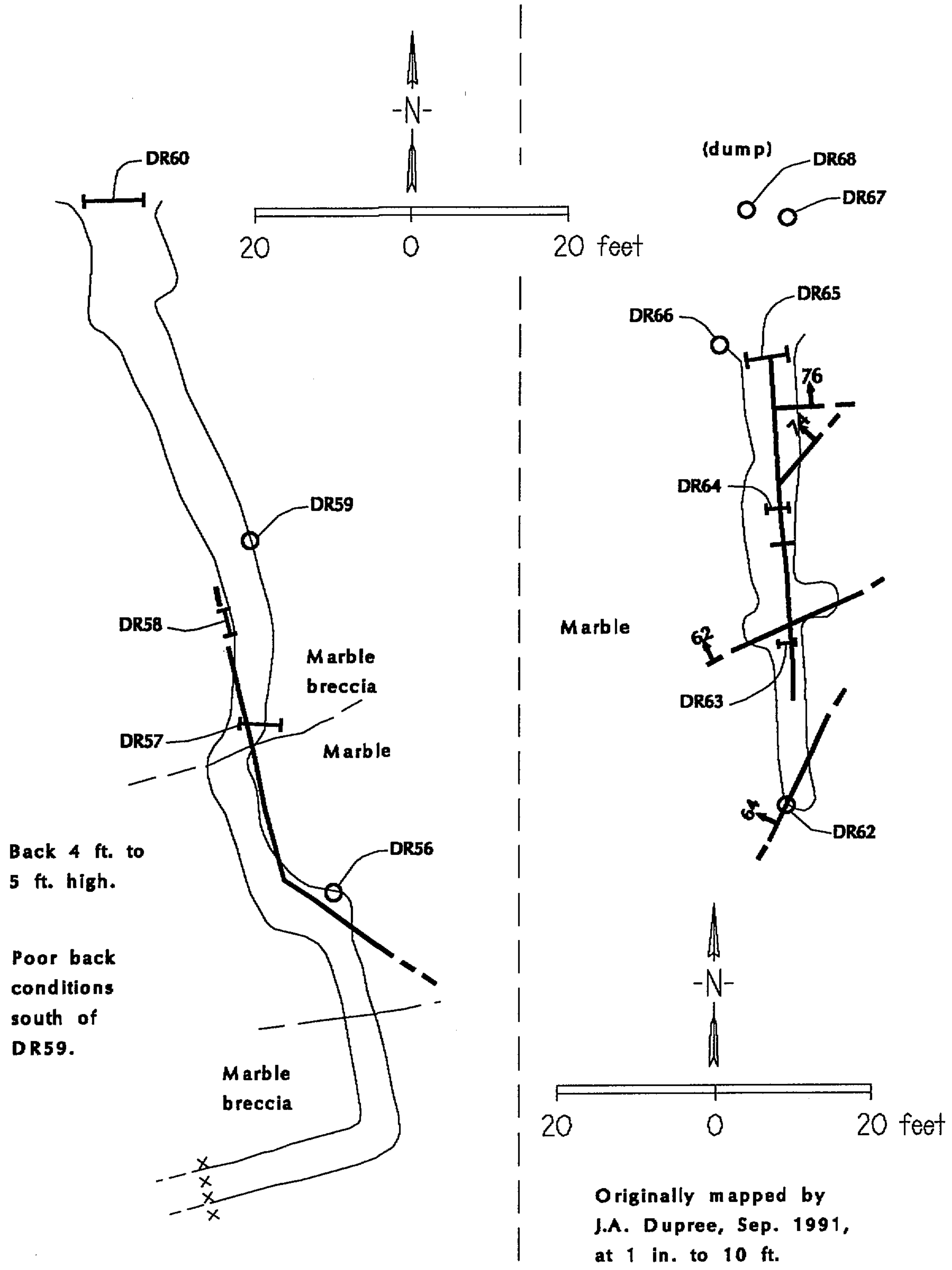


Figure 49.--Part of Jordan Canyon prospects, with sample localities DR 56-60, DR 62-68, Dragoon Mountains Unit.

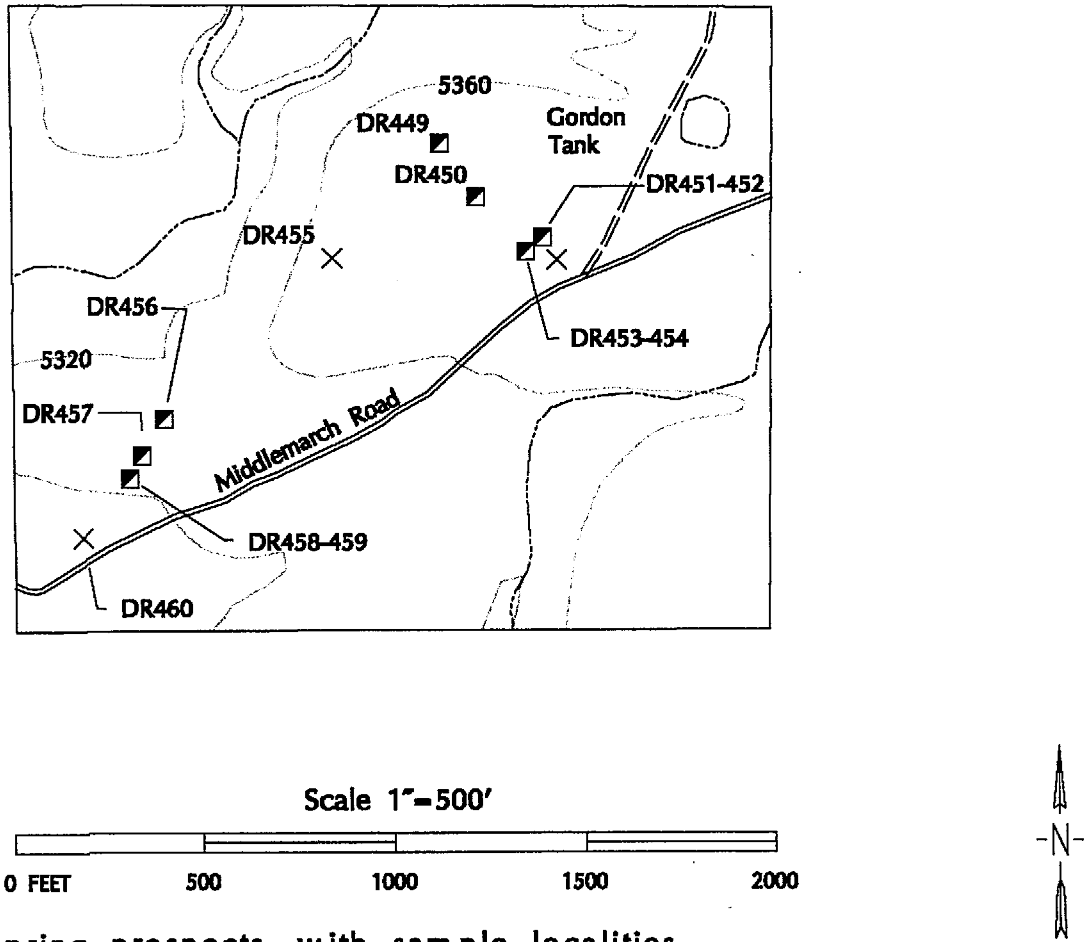


Figure 50.--Gordon Spring prospects, with sample localities DR 449-460, Dragoon Mountains Unit.

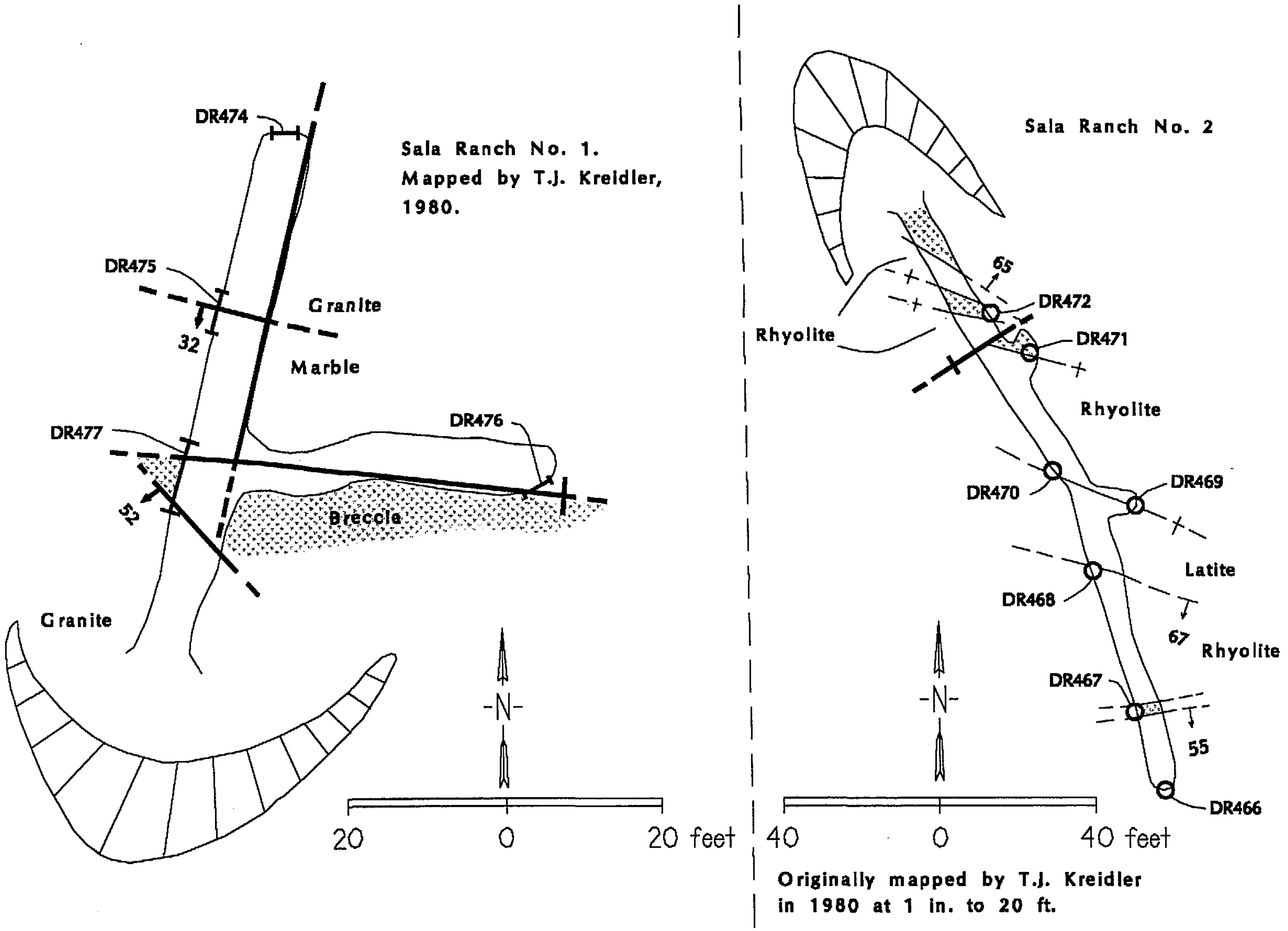


Figure 51.--Sala Ranch No. 1 and No. 2 prospect adits, with sample localities DR 466-472, and DR 474-477, Dragoon Mountains Unit.

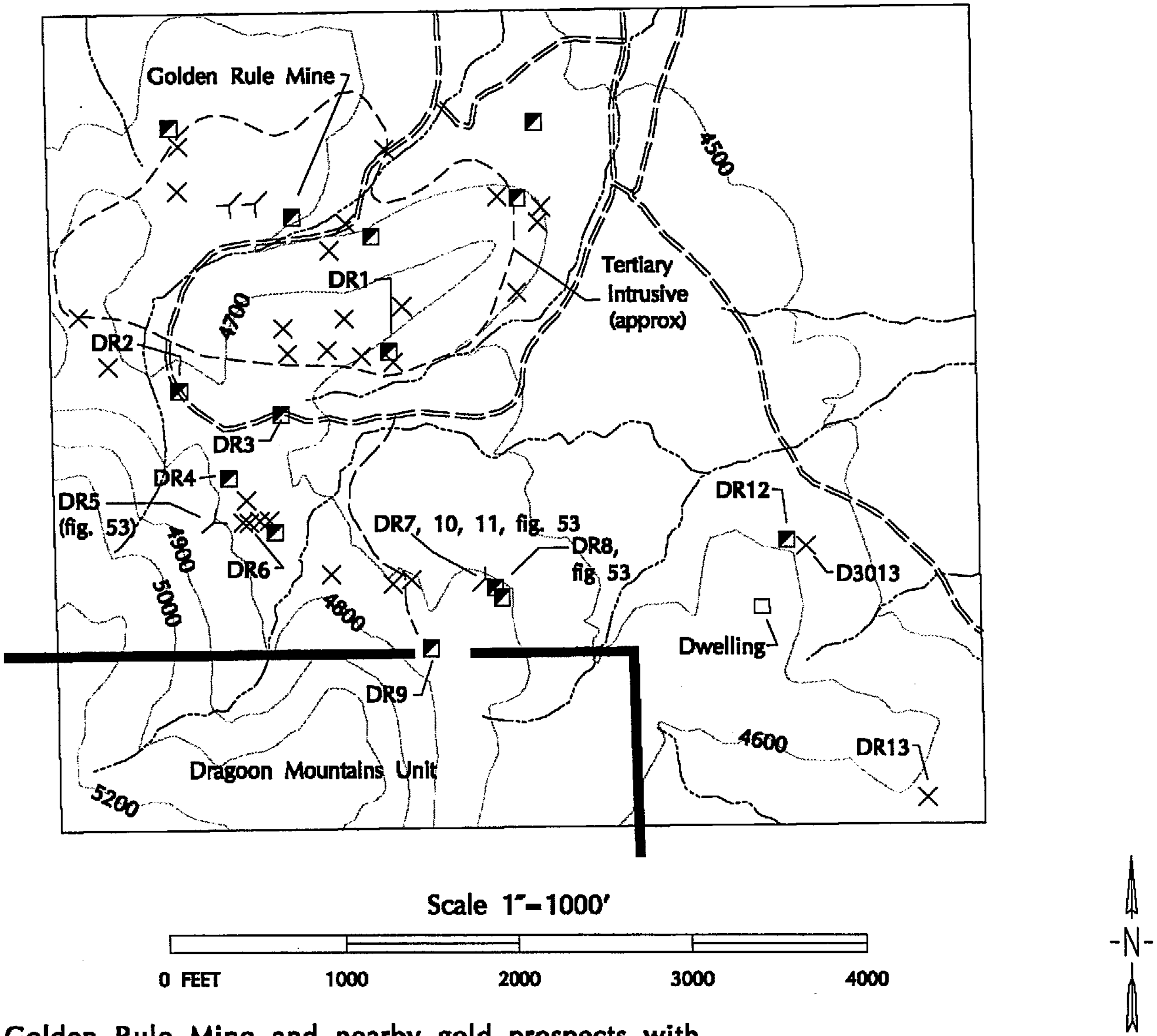


Figure 52.– Golden Rule Mine and nearby gold prospects with sample localities DR 1-13, Dragoon Mountains Unit northern boundary.

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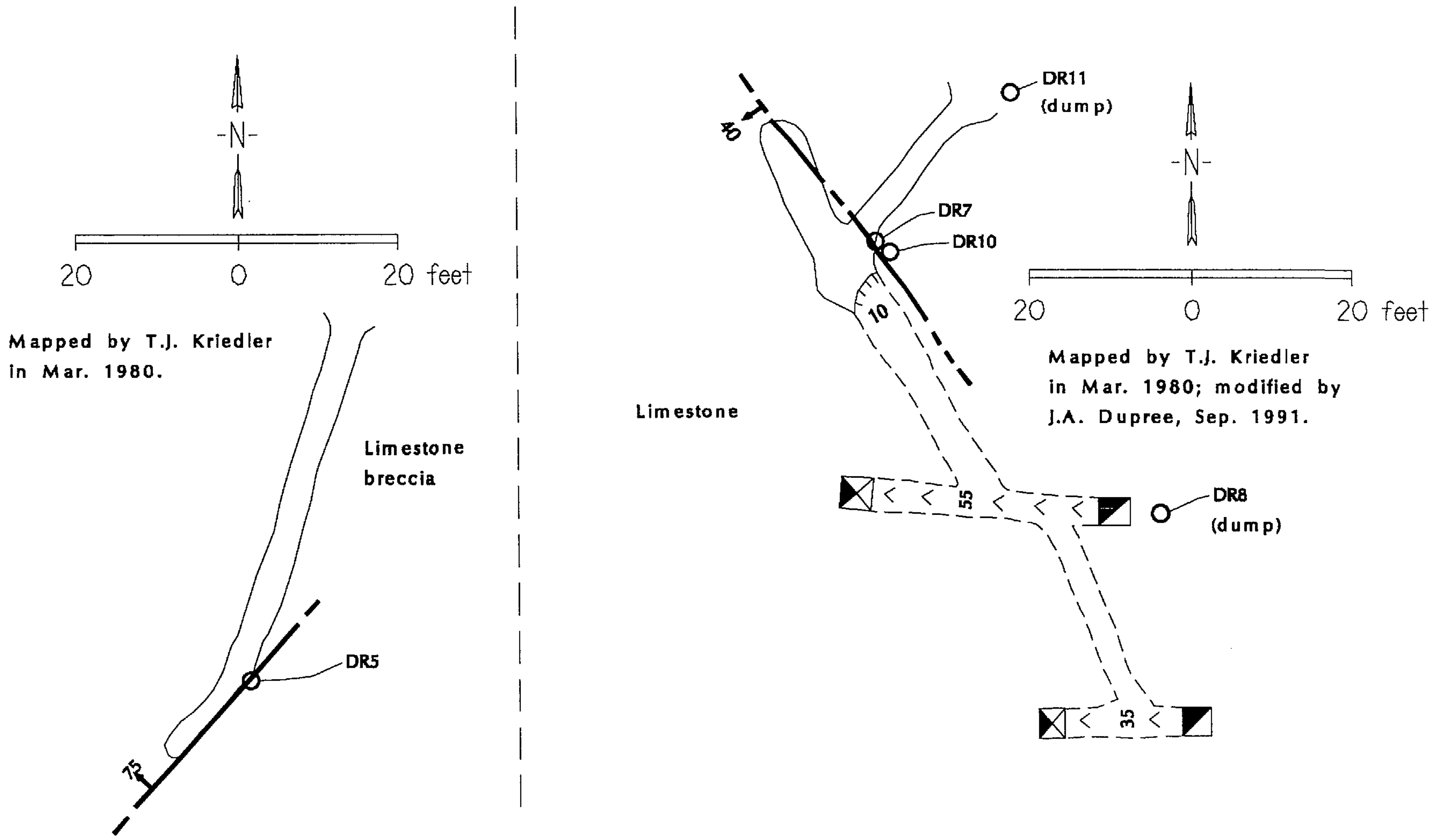

Figure 53.--Prospects of Golden Rule district, with sample localities DR 5, DR 7-8, DR 10-11, near Dragoon Mountains Unit northern boundary.

Appendix A.--Descriptions of reconnaissance geologic rock-chip samples from Dragoon Mountains Unit, Coronado National Forest. Assays are in appendixes B, C. Sample type definitions are as follows. Chip samples are a regular series of rock chips taken in a continuous (or semi-continuous) line across a mineralized zone or other exposure, and usually across the entire width or thickness of that exposure. Grid and grab samples are from mine/prospect dumps. The grid type are taken systematically over an area to convey possible mineral value distributed in a dump. The grab type are taken unsystematically, usually as a background check, where no specific mineral zone is known or expected. In some cases, grab samples may be collected from an outcrop, for similar reasons. Select samples are often from a mine/prospect dump and are select chips of a specific rock type; select samples can also be collected from an in-place mineral structure to convey assays for the specific zone. Samples noted as "high-grade" are select samples collected from the most intensely mineralized (usually metallized) rock available in dumps, outcrops, or other exposed mineral zones. "Length" is that of rock-chip measured intervals for applicable samples. None listed for select, high-grade, grid, or grab samples.

Number	Type	Length	Description
DR1	Grid?	n/a	Shaft (see fig. 52), 10-ft by 10-ft, with uncertain depth, exposes granitic intrusive into limestone; sample of both lithologies from dump; abundant hematite, limonitic stain; brecciated vein quartz with moderate copper stain, limonite after pyrite. Sample from 1980 USBM RARE II study (no. 17 in Kreidler, 1981); pulp re-assayed in 1992.
DR2	Chip	3 ft	Shaft (see fig. 52), 10-ft by 10-ft, and 15-ft-deep on fault (E.-W., dips S. 65°) through Abrigo? limestone; sample of calcareous gouge, abundant hematite; fault true width is 1 ft. Sample from 1980 USBM RARE II study (no. 18 in Kreidler, 1981); pulp re-assayed in 1992.
DR3	Grid?	n/a	Shaft (see fig. 52), 12-ft by 12-ft, and 68-ft-deep excavated in limestone, fresh with no visible structure; dump contains granite, limestone, vein quartz, marble. Sample from 1980 USBM RARE II study (no. 19 in Kreidler, 1981); pulp re-assayed in 1992.
DR4	Chip	2 ft	Inclined shaft (see fig. 52), collared in limestone breccia (N. 30° W., vertical) with abundant hematite stain, malachite. Sample from 1980 USBM RARE II study (no. 20 in Kreidler, 1981); pulp re-assayed in 1992. The dual inclined shaft has one incline N. 50° W. for 20 ft, and a second incline at S. 70° W. for 30 ft at 35°.
DR5	Chip	4 ft	Adit (see fig. 52, mine map, fig. 53) exposes a fault (N. 45° E., NW. 75°) through limestone breccia. Sample from 1980 USBM RARE II study (no. 21 in Kreidler, 1981); pulp re-assayed in 1992.

Number	Type	Length	Description
DR6	Grid?	n/a	Prospect pit (see fig. 52), 7-ft by 5-ft, and 4-ft-deep, in brecciated limestone with abundant hematite; no structure recognized. Sample from 1980 USBM RARE II study (no. 22 in Kreidler, 1981); pulp re-assayed in 1992.
DR7	Chip	1.2 ft	Adit interconnected to inclined shafts (see fig. 52; mine map, fig. 53), exposes fault (N. 35° W., SW. 40°), gougey, through reddish limestone; full width sampled; probably Abrigo limestone. Can't be traced on surface. Small dump, much eroded down hillside, not measured.
DR8	Select	n/a	Inclined shaft (fig. 52; mine map, fig. 53), trends S. 80° W., at 55° for 30 ft to 35-ft-depth. Structure not visible. Sample of white vein quartz (up to 3-in.wide) with calcite, manganese oxides, unidentified iron-oxide stain, chrysocolla, azurite.
DR9	Grab	n/a	Shaft, 7-ft by 3-ft collar (see fig. 52). Sample of limestone breccia from dump, abundant hematite. Structure not recognized. Sample from 1980 USBM RARE II study (no. 23 in Kreidler, 1981); pulp re-assayed in 1992. Small dump, not measured.
DR10	Chip	3 ft	Adit (see fig. 52; mine map, fig. 53). Same sample as DR7. Sample from 1980 USBM RARE II study (no. 24 in Kreidler, 1981); pulp re-assayed in 1992.
DR11	Grid	n/a	Adit (see fig. 52; mine map fig. 53). Dump sample: limestone, quartz, granite, abundant hematite, moderate limonitic material. Sample from 1980 USBM RARE II study (no. 25 in Kreidler, 1981); pulp re-assayed in 1992. Dump size unknown.
DR12	Grid?	n/a	Shaft (see fig. 52), 5-ft by 5-ft and uncertain depth; dump sample of red-weathered limestone, coarse calcite, limonitic material after pyrite, igneous dike. Dump about 70 st. Sample from 1980 USBM RARE II study (no. 16 in Kreidler, 1981); pulp re-assayed in 1992.
DR13	Grab	n/a	Prospect pit, 7-ft by 10-ft, 5-ft-deep (see fig. 52); from dump: limestone, coarse calcite, abundant hematite and limonitic stain. Sample from 1980 USBM RARE II study (no. 12 in Kreidler, 1981); pulp re-assayed in 1992.

Number	Type	Length	Description
D3013	Chip	3 ft	Prospect pit, 7-ft by 7-ft, 5-ft-deep (see fig. 52), exposes fault, N. 45° E., NW. 53° through limestone; sample of altered limestone, coarse calcite, abundant hematite stain, limonite after pyrite. Sample from 1980 USBM RARE II study (no. 13 in Kreidler, 1981); pulp could not be located and was therefore **NOT** re-assayed in 1992.
DR14	Chip	2 ft	Limestone prospect, trench, 12-ft-long, 6-ft to 10-ft across, 5-ft-deep, trending N. 40° E. (fig. 2). Exposes crinoidal limestone, gray and pink. Sample collected of a minor fracture zone (6-in.-wide) in limestone. Sample from 1980 USBM RARE II study (no. 9 in Kreidler, 1981); pulp re-assayed in 1992. Beds 1-ft- to 3-ft-thick. Background check for metallization in the limestone.
DR15	Chip	3 ft	Limestone prospect (pit 50-ft-long in one dimension, very shallow), exposes limestone, light gray and tan, calcite veinlets, 1/4-in.- to 3-in.-wide, and siliceous limestone. Sample of limestone and clay. Sample from 1980 USBM RARE II study (no. 11 in Kreidler, 1981); pulp re-assayed in 1992. Background check for metallization in the limestone. Dimensions from 1991 examination. See fig. 2.
DR16	Chip	10 ft	Marble/limestone quarry (see DR17); sample of altered(?) [perhaps weathered] zone in marble, trending N. 86° E., and roughly vertical. Sample from 1980 USBM RARE II study (no. 10 in Kreidler, 1981); pulp re-assayed in 1992. Check for metallization. See fig. 2.
DR17	Chip	28 ft	Marble/limestone quarry (same as DR16). Sample for stone (*not* assayed). Yellow-sienna marble/limestone (see photo, fig. 8) from 2-ft- to 5-ft-thick bed (base no more than 5 ft below) in 51-ft by 40-ft shallow quarry. No overburden. Blocks of marble up to 3-ft across can be quarried, based on fracturing, jointing conditions. Bound above and below by gray limestone.
DR18	Grab	n/a	Breche Saguaro marble quarry, southern pit (fig. 2; see photos, fig. 11, 12), 35-ft by 20-ft and 10-ft-deep, in variable-colored, metamorphosed, marble breccia or conglomerate. Sample for stone (*not* assayed).

Number	Type	Length	Description
DR19	Grab	n/a	Breche Saguaro marble quarry, northern pit (fig. 2), 35-ft by 30-ft and 10-ft-deep, in tan and light gray marble, some brecciated or conglomeratic. Sample for stone (*not* assayed).
DR20	Chip	12 ft	Unnamed limestone quarry; limestone is pinkish-gray, with abundant, crinoid-dominated fossils; beds up to 3-ft-thick. Sample for stone (*not* assayed); fig. 2.
DR21	Chip	8 ft	Red marble quarry (see mine map, fig. 3); pink-gray marble, thin bedded (1-ft-thick, average). See photo, fig. 9. Sample for stone (*not* assayed).
DR22	Chip	7 ft	Red marble quarry (see mine map, fig. 3); pink-gray marble, thin bedded (1-ft-thick, average). Sample for stone (*not* assayed).
DR23	Chip	6 ft	Red marble quarry (see mine map, fig. 3); pink-gray marble, thin bedded (1-ft to 2-ft-thick). Sample for stone (*not* assayed).
DR24	Chip	5 ft	Red marble quarry (see mine map, fig. 3); pyritic zone with evidence of contact metamorphism. Location only approximate. Sample from 1980 USBM RARE II study (no. 30 in Kreidler, 1981); pulp re-assayed in 1992. Check for metallization.
DR25	Chip	5 ft	Red marble quarry (see mine map, fig. 3); pyritic zone with evidence of contact metamorphism. Location only approximate. Sample from 1980 USBM RARE II study (no. 29 in Kreidler, 1981); pulp re-assayed in 1992. Check for metallization.
DR26	Chip	5 ft	Red marble quarry (see mine map, fig. 3); pyritic zone with evidence of contact metamorphism. Location only approximate. Sample from 1980 USBM RARE II study (no. 28 in Kreidler, 1981); pulp re-assayed in 1992. Check for metallization.
DR27	Chip?	not re-corded	Unnamed quarry (fig. 2; see mine map, fig. 4); same limestone as sample DR28; includes zone with minor pyrite. Sample from 1980 USBM RARE II study (no. 32 in Kreidler, 1981); pulp re-assayed in 1992. Check for metallization.
DR28	Chip	15 ft	Unnamed quarry; dark gray limestone, some brown; some slightly metamorphosed to marble. Overlies marble cobble unit (not quarried). Sample for stone (*not* assayed). Fig. 2, 4.

Number	Type	Length	Description
DR29	Chip	7 ft	Unnamed quarry; gray, recrystallized dolomite. Fig. 2.
DR30	Grab	n/a	Unnamed quarry; gray limestone, minor hematitic stain. Sample from 1980 USBM RARE II study (no. 31 in Kreidler, 1981); pulp re-assayed in 1992. Check for metallization. Fig. 2.
DR31	Chip	45 ft	Green Chip quarry (fig. 5; see mine map, fig. 6), sample of full width of the "green-chip" bed, a mixture of green slate, gray marble, and some white quartzite clasts (see photo, fig. 10). A test for any metallization in the system.
DR32	Chip	5 ft	Green Chip quarry (see mine map DR31-34, fig. 6); fault with clay gouge in the "green-chip" bed, N. 45° E., NW. 84°. Sample from 1980 USBM RARE II study (no. 27 in Kreidler, 1981); pulp re-assayed in 1992. Check for metallization.
DR33	Chip	5 ft	Green Chip quarry (see mine map DR31-34); fault with clay gouge in the "green-chip" bed, N. 25° E., vertical dip. Sample from 1980 USBM RARE II study (no. 26 in Kreidler, 1981); pulp re-assayed in 1992. Check for metallization.
DR34	Chip	6 ft	Apache Yellow marble quarry, northern pit (fig. 5; see mine map, fig. 6); yellow-white "mottled" color marble was quarried here; sample for stone (*not* assayed).
DR35	Chip	7 ft	Apache Yellow marble quarry, southern pit (see mine map DR35, fig. 6); yellow and brown marble was quarried here; sample for stone (*not* assayed).
DR36	Select	n/a	Pit, 7-ft by 5-ft and 7-ft-deep in gray marble and limestone, cut by quartz veins in fault (N. 40° W., SW. 40°). May not have been excavated for marble, but instead for metals exploration. Select of quartz from dump (total dump about 8 st). A check for metallization. Fig. 5.
DR37	Chip	25 ft	Pit, 8-ft by 5-ft and 4-ft-deep in silicified gray marble, cut by quartz veins with boxworks. May not have been excavated for marble, but instead for metals exploration. Sample taken 50 ft SE. of pit because quartz is more prevalent there. Quartz is prevalent for about 100 ft along strike. A check for metallization. Sample of entire width of vein zone collected during Apr. 1991 visit. Fig. 5.

Number	Type	Length	Description
DR38	Chip	9 ft	Outcrop of white and light gray marble; contains zone with quartz veins, N. 75° E., SE. 70°. May not have been excavated for marble, but instead for metals exploration. Sample is full width of quartz zone collected during Apr. 1991 visit. A check for metallization. Fig. 5.
DR39	Chip	10 ft	One of the White marble quarries (fig. 5; see mine map, fig. 7). White marble from fault zone (N. 40° E., NW. 55°). Sample for stone (*not* assayed).
DR40	Chip	not re-corded	One of the White marble quarries (see mine map DR30-50, fig. 7). White marble from quarry wall. Sample for stone (*not* assayed).
DR41	Chip	not re-corded	One of the White marble quarries (see mine map DR30-50, fig. 7). Banded marble zone that is NE. of DR40 zone; 1/2 white marble, and 1/2 brown and green marble from quarry wall. Sample for stone (*not* assayed).
DR42	Chip	not re-corded	One of the White marble quarries (see mine map DR30-50, fig. 7). Banded marble zone that is NE. of DR40 zone; 1/2 white marble, and 1/2 brown and green marble from quarry wall. Sample marble as DR41. Sample for stone (*not* assayed).
DR43	Chip	not re-corded	One of the White marble quarries (see mine map DR30-50, fig. 7). White marble from quarry wall. Same marble as DR40. Sample for stone (*not* assayed). See photo, fig. 13.
DR44	Chip	not re-corded	One of the White marble quarries (see mine map DR30-50, fig. 7). White marble from quarry wall. Sample for stone (*not* assayed).
DR45	Select	n/a	One of the White marble quarries (see mine map DR30-50, fig. 7). White marble from boulder stockpile. Sample for stone (*not* assayed).
DR46	Chip	not re-corded	One of the White marble quarries (see mine map DR30-50, fig. 7). White marble from quarry wall. Sample for stone (*not* assayed).
DR47	Chip	not re-corded	One of the White marble quarries (see mine map DR30-50, fig. 7). White marble from quarry wall. Sample for stone (*not* assayed).

Number	Type	Length	Description
DR48	Chip	not re-corded	One of the White marble quarries (see mine map DR30-50, fig. 7). White marble from quarry wall. Sample for stone (*not* assayed).
DR49	Chip	not re-corded	One of the White marble quarries (see mine map DR30-50, fig. 7). White marble from quarry wall. Sample for stone (*not* assayed).
DR50	Select	n/a	One of the White marble quarries (see mine map DR30-50, fig. 7). White marble from chip stockpile. Sample for stone (*not* assayed).
DR51	Chip	5 ft	Bulldozer cut, 16-ft by 16-ft and 7-ft-deep, exposes coarse-grained quartz-biotite granite with quartz veining and malachite stain, chalcopyrite(?). Sample from 1980 USBM RARE II study (no. 34 in Kreidler, 1981); pulp re-assayed in 1992. Fig. 5.
DR52	Grab	n/a	Jordan Canyon prospects (see fig. 5); shaft, 5-ft by 5-ft, 24-ft-deep; sample of granite, gneiss and schist from dump; abundant hematite and limonitic stains; quartz veining; some pyrite, chalcopyrite(?). Sample from 1980 USBM RARE II study (no. 36 in Kreidler, 1981); pulp re-assayed in 1992.
DR53	Grid	n/a	Jordan Canyon prospects (see fig. 5); from same dump as DR52, collected in 1989 survey; bedrock not visible in shaft walls; quartz veins may be layering in biotite-muscovite-quartz gneiss. Dump about 40 st.
DR54	Grab	n/a	Jordan Canyon prospects (see fig. 5); shaft, 8-ft by 9-ft, 11-ft-deep; same rock as DR52. Sample from USBM 1980 RARE II study (no. 35 in Kreidler, 1981); pulp re-assayed in 1992.
DR55	Grid	n/a	Jordan Canyon prospects (see fig. 5); grid from same dump as DR54, collected in 1989 survey; biotite-muscovite-quartz gneiss; moderate, unidentified iron-oxide stain; some quartz veins. Dump about 20 st.
DR56	Chip	4 ft	Jordan Canyon prospects (see fig. 5; mine map, fig. 49); adit. Fault zone in marble; malachite, azurite, pyrite, chalcopyrite. Sample from 1980 USBM RARE II study (no. 44 in Kreidler, 1981); pulp re-assayed in 1992.

Number	Type	Length	Description
DR57	Chip	4 ft	Jordan Canyon prospects (see fig. 5; mine map DR56-60, fig. 49); adit. Fault zone in marble; malachite, azurite, pyrite, chalcopyrite. Sample from 1980 USBM RARE II study (no. 45 in Kreidler, 1981); pulp re-assayed in 1992.
DR58	Chip	4 ft	Jordan Canyon prospects (see fig 5; mine map DR56-60, fig. 49); adit. Fault zone in marble; malachite, azurite, pyrite, chalcopyrite. Sample from 1980 USBM RARE II study (no. 46 in Kreidler, 1981); pulp re-assayed in 1992.
DR59	Chip	2 ft	Jordan Canyon prospects (see fig. 5; mine map DR56-60, fig. 49); adit. Marble breccia.
DR60	Chip	7 ft	Jordan Canyon prospects (see fig. 5; mine map DR56-60, fig. 49); adit. Schist with quartz lenses at portal; fractures contain epidote, tremolite, pyrite.
DR61	not re-cord-ed	not known	Near Jordan Canyon prospects (see fig. 5); sample of granite-limestone contact.
DR62	Chip	0.75 ft	Jordan Canyon prospects (see fig. 5; mine map, fig. 49); adit. Silicified fracture in marble; sampled full width; 1/2 vein quartz (white and clear) and 1/2 gouge, with minor chalcopyrite.
DR63	Chip	1 ft	Jordan Canyon prospects (see fig. 5; mine map, fig. 49); adit. Fault zone, 60% clay gouge with garnet, 40% white quartz vein; minor epidote, limonitic stain, and bright-yellow-stained clay (sulfur?).
DR64	Chip	1.3 ft	Jordan Canyon prospects (see fig. 5; mine map, fig. 49); adit. Marble at intersecting faults; minor weathered pyrite and copper bloom.
DR65	Chip	5 ft	Jordan Canyon prospects (see fig. 5; mine map, fig. 49); adit. Marble and malachite skarn; some schist.
DR66	Chip	2 ft	Jordan Canyon prospects (see fig. 5; mine map, fig. 49); adit. Schist west of portal with epidote, magnetite.
DR67	Grid	n/a	Jordan Canyon prospects (see fig. 5; mine map, fig. 49); adit. Sample of dump; mostly marble; contains about 100 st. Minor pyrite, chalcopyrite, malachite, azurite. Sample from 1980 USBM RARE II study (no. 47 in Kreidler, 1981); pulp re-assayed in 1992.

Number	Type	Length	Description
DR68	Select	n/a	Jordan Canyon prospects (see fig. 5; mine map, fig. 49); adit. Same dump as DR67; select from high-grade pile, with abundant malachite, azurite, pyrite, chalcopyrite. Sample from 1980 USBM RARE II study (no. 48 in Kreidler, 1981); pulp re-assayed in 1992.
DR69	Chip	5 ft	Jordan Canyon prospects (see fig. 5); trench exposing N.-S.-striking, W.-dipping fault with abundant malachite, azurite, limonitic stain, hematite, sphalerite(?), siderite, calcite cement, epidote. Sample from 1980 USBM RARE II study (no. 41 in Kreidler, 1981); pulp re-assayed in 1992. Fault extent not known.
DR70	Select ?	n/a	Jordan Canyon prospects (see fig. 5); shaft, 8-ft by 8-ft, 12-ft-deep, driven on quartz vein in schist and granite. Sample of this vein material, which has abundant azurite, malachite, hematite, limonitic stain. Sample from 1980 USBM RARE II study (no. 40 in Kreidler, 1981); pulp re-assayed in 1992. Vein size, extent not known.
DR71	Select ?	n/a	Jordan Canyon prospects (see fig. 5); shallow pit (dimensions not recorded) on quartz vein and skarn(?). Abundant epidote. Sample from 1980 USBM RARE II study (no. 42 in Kreidler, 1981); pulp re-assayed in 1992. Vein size, extent not known.
DR72	Select ?	n/a	Jordan Canyon prospects (see fig. 5); shaft on fault breccia; quartz, hematite, sphalerite; some malachite, azurite, unidentified iron-oxide staining. Sample from 1980 USBM RARE II study (no. 43 in Kreidler, 1981); pulp re-assayed in 1992. Fault size, extent not known.
DR73	Grab?	n/a	Jordan Canyon prospects (see fig. 5); shallow pit (8-ft by 10-ft, 2-ft-deep in quartz-biotite gneissic granite; jointing is N.-S., vertical. Appears barren. Sample from 1980 USBM RARE II study (no. 33 in Kreidler, 1981); pulp re-assayed in 1992.
DR74	Grab?	n/a	Jordan Canyon prospects (see fig. 5); shaft, 7-ft by 10-ft, 20-ft-deep to water (in 1989); in sheared granite, schist(?); magnetite(?), minor hematite and limonitic stain. Sample from 1980 USBM RARE II study (no. 39 in Kreidler, 1981); pulp re-assayed in 1992. Possibly driven on N. 5° W., vertical fault. Fault extent not known.

Number	Type	Length	Description
DR75	Grid	n/a	Jordan Canyon prospects (see fig. 5); same shaft as DR74; chloritic schist from dump. Dump about 10 st.
DR76	Chip	3 ft	Rainbow patent, open cut (S. 60° W.), 30-ft-long, 15-ft-wide, 12-ft to 3-ft-deep. Skarn(?) and granite with abundant limonitic stain; visible pyrite, chalcopyrite, sphalerite, galena. Sample from 1980 USBM RARE II study (no. 38 in Kreidler, 1981); pulp re-assayed in 1992. The SW. face connected to inclined, 50-ft-deep shaft (obliterated by filling, slough). Fig. 5.
DR77	Grid	n/a	Rainbow patent, open cut DR76, representative dump sample; pyritic schist with quartz veinlets; same schist crops out in wash to east. Dump about 100 st. Dump is south of open cut. High-grade rock to north of open cut (observed in 1989 visit) was not sampled. Fig. 5.
DR78	Select	n/a	Rainbow patent. High-grade from dump of vertical, 85-ft-deep shaft (flooded at -30 ft in 1989); pyritic, sometimes siliceous schist, pyritic quartz veinlets; pyrite abundant. Dump about 200 st. Fig. 5.
DR79	Grab	n/a	Rainbow patent. Non-select sample of same dump as DR78. Abundant skarn? with pyrite, possible chalcopyrite, abundant limonitic stain. Sample from 1980 USBM RARE II study (no. 37 in Kreidler, 1981); pulp re-assayed in 1992. Fig. 5.
DR80	Chip	3 ft	Buena Vista Mine (fig. 5), skarn, same as sample DR81. Sample from 1980 USBM RARE II study (no. 783 in Kreidler, 1981); pulp re-assayed in 1992. Open cut size: 12-ft along strike, 10-ft-deep, 5-ft-wide.
DR81	Chip	5 ft	Buena Vista Mine (fig. 5), skarn (N. 10° W., SW. 80°) exposed in open cut; not exposed to north; hosted in limestone; probably same skarn as that exposed in face of adit DR82-87. Sample from 1989 visit to the site.
DR82	Chip	4 ft	Buena Vista Mine (fig. 5, 46), brecciated, silicated limestone; probable outer extent of the skarn explored by inaccessible raise, winze at adit face. Sample from 1980 USBM RARE II study (no. 782 in Kreidler, 1981); pulp re-assayed in 1992.
DR83	Chip	3 ft	Buena Vista Mine (see fig. 5, 46); silicified limestone in fault. Sample from 1980 USBM RARE II study (no. 781 in Kreidler, 1981); pulp re-assayed in 1992.

Number	Type	Length	Description
DR84	Chip	3 ft	Buena Vista Mine (see fig. 5, 46); clayey fault gouge in limestone. Sample from 1980 USBM RARE II study (no. 780 in Kreidler, 1981); pulp re-assayed in 1992.
DR85	Chip	3.5 ft	Buena Vista Mine (see fig. 5, 46); fractured limestone. Sample from 1980 USBM RARE II study (no. 779 in Kreidler, 1981); pulp re-assayed in 1992.
DR86	Grid	n/a	Buena Vista Mine (see fig. 5, 46); representative sample of dump, includes silicated carbonate rock on dump; epidote, fluorite. Dump about 50 st.
DR87	Select	n/a	Buena Vista Mine (see fig. 5, 46); from same dump as DR86; sample of black, vesicular dump rock; not seen in outcrop or in the accessible part of the adit.
DR88	Select	n/a	Buena Vista Mine (see fig. 5). Approximately 75-ft to 80-ft-long on a N. 10° W. trend. Flooded throughout; inaccessible beyond 25 ft in from portal due to water depth (above waist level). Has been dammed as a water-supply source. Sample of skarn from dump; mostly brown and green calc-silicates with pyrite, specular hematite. Banded marble. Dump about 700 st.
DR89	Grab	n/a	Buena Vista Mine (see fig. 5). Same dump as DR88; silicified limestone. Sample from 1980 USBM RARE II study (no. 778 in Kreidler, 1981); pulp re-assayed in 1992.
DR90	Chip	6 ft	Outcrop of brecciated quartzite (or silicified sandstone?), N. 40° E., dips NW. at high angle; exposed for 200 ft along strike, then covered. Fig. 5.
DR91	Chip	18 ft	Prospect open cut (25-ft by 10-ft, depth not known), exposing silicified, argillized porphyry; some chlorite on fractures. Sample exposed porphyry. Extent unknown. There is a 10-ft-long adit, trending N. 77° E., at the north edge of this open cut. Dump about 60 st. No map; see fig. 5.
DR92	Chip	4 ft	Burrito de Fierro Mine (pl. 1; see mine map, fig. 46); limestone with quartz veins in breccia zone. Sample from 1980 USBM RARE II study (no. 768 in Kreidler, 1981); pulp re-assayed in 1992.

Number	Type	Length	Description
DR93	Chip	4 ft	Burrito de Fierro Mine (fig. 46); silicated limestone, galena, in breccia zone. Sample from USBM 1980 RARE II study (no. 769 in Kreidler, 1981); pulp re-assayed in 1992.
DR94	Chip	7 ft	Burrito de Fierro Mine (fig. 46); fault zone in limestone, galena. Sample from 1980 USBM RARE II study (no. 770 in Kreidler, 1981); pulp re-assayed in 1992.
DR95	Chip	7 ft	Burrito de Fierro Mine (fig. 46); fault zone in limestone, galena. Sample from 1980 USBM RARE II study (no. 771 in Kreidler, 1981); pulp re-assayed in 1992.
DR96	Select	n/a	Hubbard Mine (fig. 5; mine map, fig. 47). Discovery shaft. Exposes skarn, 3-ft-thick, N. 40° W., SW. 85°. Not on strike with either of two zones in upper adit, Democrat patent. Can't be traced on strike (talus cover). Selected skarn off dump (can't reach in place due to shaft conditions) but did not high-grade. No visible sulfides.
DR97	Chip	6 ft	Hubbard Mine (fig. 5; mine map, fig. 47), Democrat patent, upper adit, sulfide zone at NW. face; sphalerite-enriched skarn (12% to 15% sphalerite), minor pyrite. Fault offset to the NE. from the rest of the mineralized zone (DR98-100); not exposed to the NW. Zone exposed, back-to-sill.
DR98	Chip	3.5 ft	Hubbard Mine (fig. 5; mine map, fig. 47), Democrat patent, upper adit, skarn; irregular pods of sphalerite and galena (up to 5-in.-long); abundant limonitic stain. Zone exposed, back-to-sill. Sample from 1980 USBM RARE II study (no. 776 in Kreidler, 1981); pulp re-assayed in 1992.
DR99	Chip	3 ft	Hubbard Mine (fig. 5; mine map, fig. 47), Democrat patent, upper adit, silicified limestone (same mined zone as DR98) with fine grained black metallics, too small to identify. Sample from 1980 USBM RARE II study (no. 775 in Kreidler, 1981); pulp re-assayed in 1992.
DR100	Chip	4 ft	Hubbard Mine (fig. 5; mine map, fig. 47), Democrat patent, upper adit, silicified limestone; same mined zone as DR98-99. Sample from 1980 USBM RARE II study (no. 774 in Kreidler, 1981); pulp re-assayed in 1992.

Number	Type	Length	Description
DR101	Chip	6.5 ft	Hubbard Mine (fig. 5, 47), Democrat patent, upper adit, skarn; a second mined zone, SW. of DR98-100. Stoping; most of mine production from this zone.
DR102	Chip	5 ft ?	Hubbard Mine (fig. 5, 47), Democrat patent, upper adit, skarn; a second mined zone, SW. of DR98-100. Same zone as DR101. Stoping; most of mine production from this zone. Sample from 1980 USBM RARE II study (no. 773 in Kreidler, 1981); pulp re-assayed in 1992.
DR103	Select	n/a	Hubbard Mine (fig. 5, 47), Democrat patent, upper adit, high-grade from stockpile, contains about 50 st.
DR104	Grid	n/a	Hubbard Mine (fig. 5, 47), Democrat patent, upper adit, representative sample from dump, which contains about 400 st. Mostly limestone; minor skarn.
DR105	Grid	n/a	Hubbard Mine (fig. 5, 47), Democrat patent, lower adit dump; NW. lobe (about 50 st). Mostly skarn and diopsidic marble. Some quartz-feldspar porphyry.
DR106	Grid	n/a	Hubbard Mine (fig. 5, 47), Democrat patent, lower adit dump, SE. lobe (about 80 st). Quartz-feldspar porphyry, silicified locally, with light iron-oxide stain.
DR107	Grid	n/a	Hubbard Mine (fig. 5), Democrat patent, Discovery shaft, representative dump sample. Sample from 1980 RARE II study (no. 777 in Kreidler, 1981); pulp re-assayed in 1992. Shown in Kreidler (1981, map) as collected at lower, caved adit DR105-106, but it actually from Discovery shaft, about 250 ft to the NW.
DR108	Chip	15 ft	Hubbard Mine (fig. 5, 47), Sherman patent. Skarn exposed at inclined shaft. Fault controlled. Sampled full thickness.
DR109	Chip	18 ft	Hubbard Mine (fig. 5, 47), Sherman patent. Adjoins DR108. Marble wallrock with approximately 1/3 skarn contamination. Collected during Dec. 1989 visit to the site. Sample still retains some value as a test of metallization in carbonate bedrock.
DR110	Grab	n/a	Hubbard Mine (fig. 5, 47), Sherman patent. Dump of inclined shaft and adjoining adit (DR108-109) about 200 st. Epidotized marble. Most washed away in gully (as of summer, 1992). Sample from 1980 USBM RARE II study (no. 772 in Kreidler, 1981); pulp re-assayed in 1992.

	Type	Length	Description
DR111	Chip	12 ft	Naoe claims (see fig. 5). Skarn, N. 30° W., SW. 43° above portals of two parallel, 5-ft-long adits at the upper part of the claims. A few feet below is another prospect adit (10-ft-long) in the same skarn; no sample there.
DR112	Chip	1 ft	Naoe claims (see fig. 5). Skarn, N. 25° E., NW. 57°, total 6-ft-wide, exposed by 20-ft-long adit (N. 27° E.) with a 30-ft-long open cut, on trend, and an inclined shaft (inclined at 70° on N. 66° W. trend), both at the adit portal. Skarn, as much as was reachable, collected at shaft collar because of bad back conditions in the adit.
DR113	Grab	n/a	Naoe claims (see fig. 5, and mine map DR113-117, fig. 48). Massive sulfides (sphalerite and galena, minor bornite) from ore chute. Probably driven into same skarn as DR112.
DR114	Chip	1.4 ft	Naoe claims (see fig. 5, and mine map DR113-117, fig. 48). Fracture zone in limestone, minor chlorite and epidote.
DR115	Select	n/a	Naoe claims (see fig. 5, and mine map DR113-117, fig. 48). epidotized marble from dump with manganese oxide coatings on fractures.
DR116	Grid	n/a	Naoe claims (see fig. 5, and mine map DR113-117, fig. 48). Representative dump sample. Dump about 400 st. Mostly marble/limestone.
DR117	Select	n/a	Naoe claims (fig. 5, 48); same dump as DR115-116. High-grade of marble with sphalerite and galena.
DR118	Grid	n/a	Naoe claims (see fig. 5). Shaft, 4-ft by 4-ft and 10-ft-deep. Skarn (on dump). Dump size not known. Skarn orientation: N. 45° E. (?), vertical.
DR119	Chip	0.3 ft	Naoe claims, lowest adit (see fig. 5, mine map DR119-120, fig. 48); fracture in limestone that channels water; travertine deposition.
DR120	Chip	1.5 ft	Naoe claims, lowest adit (see fig. 5, mine map DR119-120, fig. 48); skarn between two fractures in marble; minor pyrrhotite.
DR121	Grab	n/a	Seneca Mine (see fig. 41), prospect pit, 7-ft by 20-ft and 4-ft-deep exposing fractured, chloritized latite porphyry, with goethite on fractures.

Number	Type	Length	Description
DR122	Chip	4 ft	Seneca Mine (see fig. 41; mine map, fig. 42); adit driven on porphyry-hosted skarn. Skarn is 10-ft-wide here; sampled what could be reached due to mine conditions. 90% skarn with interlayered porphyry, limonitic stain from pyrite, malachite, rare azurite; 10% marble, silicified; minor gouge. Entire unit is sheared.
DR123	Chip	0.3 ft	Seneca Mine adit (see fig. 41; mine map, fig. 42). Skarn at portal, very thin; azurite, malachite, unidentified iron-oxide stain. Hosted by quartz-feldspar porphyry. Dump about 100 st.
DR124	Chip	not re-corded	Seneca Mine adit (see fig. 41; mine map, fig. 42). Same sample as DR123. Sample from 1980 USBM RARE II study, (no. 7.3 in Kreidler, 1981); pulp re-assayed in 1992.
DR125	Select	n/a	Seneca Mine (see fig. 41), lowest adit. Sample of gossan with malachite and azurite. Most of dump is skarn and porphyry, banded dolomitic marble. Dump about 400 st.
DR126	Grid	n/a	Seneca Mine (see fig. 41), lowest adit. Same dump as sample DR125. Representative of all material. Galena (?) and sphalerite(?), chalcopyrite. Sample from 1980 USBM RARE II study, (no. 8 in Kreidler, 1981); pulp re-assayed in 1992.
DR127	Chip	3 ft	Seneca Mine (see fig. 41, 43) adit. Skarn (see DR122-123) exposed at portal. Dump removed through erosion.
DR128	Chip	4 ft	Seneca Mine (see fig. 41, 43), adit. Faulted contact of skarn and porphyry.
DR129	Chip	4 ft	Seneca Mine (see fig. 41, 43), adit. Faulted contact of skarn and porphyry. Dump size negligible; most eroded down the slope to the north.

Number	Type	Length	Description
DR130	Chip	4 ft	Pittsburgh and Manhattan patents (see fig. 44), pit, 10-ft by 10-ft and 7-ft-deep exposes quartz vein (N. 46° E., NW. 23°) hosted in limestone; vein sample has minor secondary quartz, minor hematite and limonitic stain on fractures, manganese oxides. Extent of vein not recorded. Sample from 1980 USBM RARE II study (no. 767 in Kreidler, 1981); pulp re-assayed in 1992. Sample taken at a time when USBM had permission to examine this patent. Patent owners would not respond to USBM requests for access (Nov. 1989 and Mar. 1990), so no work could be done there for the Coronado National Forest mineral appraisal.
DR131	Select	n/a	Prospect shaft (see fig. 44), 8-ft by 8-ft and 28-ft-deep, sunk on pyritic zone. Possibly drifting off the shaft at depth (not specified). Sample of pyritized limestone and marble with minor malchite, azurite, native copper(?) from dump. Dump size not known. Sample from 1980 USBM RARE II study (no. 762 in Kreidler, 1981); pulp re-assayed in 1992.
DR132	Chip	4.2 ft	Prospect adit, St. Francis area (see fig. 44, mine map DR132, fig. 45). Sample of fault through marble, iron-oxide-stained.
DR133	Select	n/a	Prospect shaft, St. Francis area (see fig. 44), size not recorded. Shaft walls expose interlayered granite and quartzite; sample from dump of mafic intrusive with disseminated white quartz (80% quartz), disseminated pyrite. Collar of shaft is marble. Possible small chimney.
DR134	Chip	100 ft	Chloritized granite in exploration road cut through St. Francis area (see fig. 44). Deeply weathered, pyritic (<5% sulfides). True vertical thickness of granite in this sample: 6 ft. A check for disseminated gold in the region.
DR135	Chip	4 ft	St. Francis area (see fig. 44, mine map DR135, fig. 45), prospect adit. Fault contact of quartzite and granite, which has <1% disseminated pyrite.
DR136	Grab	n/a	St. Francis area (see fig. 44); silicified rock (quartzite?) and chloritized granite along exploration road cut west of adit DR137-142. A check for regional precious metals content.

Number	Type	Length	Description
DR137	Chip	4.5 ft	St. Francis Mine (see fig. 44, mine map, fig. 45), upper adit. Mineralized, low-angle, silicated fracture, which was the mining target in this adit. Brecciated, argillized granite and travertine. Minor limonitic stain (after pyrite?). Sample from 1980 USBM RARE II study (no. 764 in Kreidler, 1981); pulp re-assayed in 1992.
DR138	Chip	4? ft	St. Francis Mine (see fig. 44, mine map, fig. 45), upper adit. Same fracture zone as DR137; limonitic stain. Sample from 1980 USBM RARE II study (no. 765 in Kreidler, 1981); pulp re-assayed in 1992.
DR139	Chip	6 ft	St. Francis Mine (see fig. 44; mine map, fig. 45), upper adit. Same fracture zone as DR137-138; brecciated zone, abundant hematite and limonitic stain. Sample from 1980 USBM RARE II study (no. 766 in Kreidler, 1981); pulp re-assayed in 1992.
DR140	Chip	6.1 ft	St. Francis Mine (see fig. 44; mine map, fig. 45), upper adit. Same fracture zone as DR137-139; quartz-enriched fault zone, clayey, through chloritized granite. Up to 6.5-ft-wide. Secondary enrichment possible from weathering.
DR141	Chip	6.5 ft	St. Francis Mine (see fig. 44; mine map, fig. 45), upper adit. Same fracture zone as DR137-140; same lithology as DR140; epidotized; directly overlain by marble.
DR142	Chip	4 ft	St. Francis Mine (see fig. 44; mine map, fig. 45), upper adit. Same fracture zone as DR137-141; azurite, malachite, limonitic stain, pyrite. Sample from 1980 USBM RARE II study (no. 763 in Kreidler, 1981); pulp re-assayed in 1992.
DR143	Chip	5 ft	St. Francis Mine (see fig. 44; mine map, fig. 45), lower adit. Mined sulfide zone hosted by limestone; galena, sphalerite, chalcopyrite. Sample from 1980 USBM RARE II study (no. 6 in Kreidler, 1981); pulp re-assayed in 1992.
DR144	Chip	4 ft	St. Francis Mine (see fig. 44; mine map, fig. 45), lower adit. Same limestone-hosted sulfide zone as DR143. Sample from 1980 USBM RARE II study (no. 5 in Kreidler, 1981); pulp re-assayed in 1992.

Number	Type	Length	Description
DR145	Chip	1.5 ft	St. Francis Mine (see fig. 44; mine map DR143-149, fig. 45), lower adit. Same limestone-hosted sulfide zone as DR143-144. Sulfide content: 5% to 20%; chalcopyrite, bornite, pyrite, sphalerite; highly silicified.
DR146	Chip	5 ft	St. Francis Mine (see fig. 44; mine map DR143-149, fig. 45), lower adit. Same limestone-hosted sulfide zone as DR143-145. Zone becomes stockwork-like in upper stope; silicified limestone, marble, abundant sphalerite, galena, moderate pyrite. Sample from 1980 USBM RARE II study (no. 2 in Kreidler, 1981); pulp re-assayed in 1992.
DR147	Chip	3 ft	St. Francis Mine (see fig. 44; mine map DR143-149, fig. 45), lower adit. Same limestone-hosted sulfide zone as DR143-146. Sample from 1980 USBM RARE II study (no. 3 in Kreidler, 1981); pulp re-assayed in 1992.
DR148	Chip	3 ft	St. Francis Mine (see fig. 44; mine map DR143-149, fig. 45), lower adit. Same limestone-hosted sulfide zone as DR143-147. Sample from 1980 USBM RARE II study (no. 1 in Kreidler, 1981); pulp re-assayed in 1992.
DR149	Select ?	n/a	St. Francis Mine (see fig. 44; mine map DR143-149, fig. 45), lower adit. Presumably high-grade of rock off the dump that was excavated from the DR143-148 sulfide zone. No further data available from 1989 visit to the site.
DR150	Chip	8.5 ft	Stronghold Canyon "beryl" prospect (pl. 1). Small excavation driven into hillside for 5 ft in N. 45° W. direction. Opening nearly obliterated by slough and boulders in Nov. 1989. Contact of epidotized, silicated limestone and a fine-grained, felsic dike, locally pegmatitic. Includes 1.8-ft-wide zone in skarn with chlorite and azurite. Bureau field geologist examining site in Nov. 1989 suspects that crystalline epidote at the dike-limestone contact was mistakenly identified as beryl by earlier examiners.

Number	Type	Length	Description
DR151	Chip, semi-continuous	22 ft	Skarn (fig. 28, 30), approximately N. 30° W., NE. 20°; brown calc-silicates and epidote with about 5% sphalerite, and limestone with weak skarn. Continuous structure but intermittent outcrop exposure (soil and talus cover is a problem); part of DR152-154 skarn, and possibly a northern extension of Abril Mine skarn. Total zone (DR151-154) is 34-ft-thick. Sample is base of zone.
DR152	Chip	6 ft	Skarn (fig. 28, 30), approximately N. 30° W., NE. 20°, composed of punky, white marble and sphalerite laminations, 1/8 in.- to 11-in.-thick (15% by volume) paralleling skarn orientation. Top of DR151-154 skarn.
DR153	Chip	5 ft	Adit (fig. 28, 30) driven 5 ft of skarn out of 33-ft-thick zone; top 6 ft (DR152) left for roof support and bottom 22 ft (DR151) not excavated. Skarn N. 34° E., SE. 26°, 5% sphalerite overall; basal 3.5 ft of calc-silicates and epidote, friable; upper 1.5 ft same but also includes sphalerite laminations (ZnS 20% by volume of upper 1.5 ft), 1/8 in.- to 1/4-in.-thick and parallel to skarn orientation.
DR154	Chip	5 ft	Adit (fig. 28, 30) driven on same horizon in DR151-154 skarn as sample DR153. Skarn strikes N.-S., dips E. 14°; lower 3 ft of brown calc-silicates with yellow garnet, brown calcite, and includes some limestone with weak skarn; upper 2 ft of silicated limestone with 20% sphalerite.
DR155	Chip	3.2 ft	Skarn, N. 50° W., NE. 55°, in pit, 8 ft by 5 ft, 6-ft-deep; 8 ft thickness exposed which is not full thickness, as both contacts are covered. Sample of first 3.2 ft exposed on hangingwall side is marble with 30% sphalerite by volume in laminations. Bottom 4.8 ft on footwall side is 50% skarn (brown-green calc-silicates, garnet, brown calcite, minor epidote) and 50% marble. Can't trace on strike due to soil, very heavy brush; visibility less than 10 ft; one literally must crawl in to this site. Fig. 28.
DR156	Chip	6 ft	Abril mine, level 5 (lowest, fig. 28; see mine map, fig. 29). Fault, 8 ft total thickness, of highly silicified limestone, epidote (15% to 20%), chloritized; sampled zone where fault widens.

Number	Type	Length	Description
DR157	Chip	5 ft	Abril mine, level 5 (fig. 28; see mine map, fig. 29). Fault, total thickness, of highly silicified limestone (50% to 90% silica), with chlorite, minor limonitic stain; same fault as DR156. This entire drift from DR157 to the SE. driven under DMA (Defense Minerals Administration) contract I-DMA-E210 during 1951 to 1953. Drift includes 11 down-hole D.D.H.'s (see map) drilled to explore the DR156-157 fault zone. No ore was found through the drilling.
DR158	Chip	15 ft	Abril Mine, level 4 (fig. 28; mine map, fig. 29), epidotized zone (N. 80° W., SW. 70°) in limestone (recrystallized, slightly silicified, green and white in color). Alteration rim of the sphalerite mineralization occurring above and to the west (see DR159). Sampled full thickness.
DR159	Chip	2.5 ft	Abril Mine, level 4 (fig. 28; mine map, fig. 29). Skarn (N. 70° W., NE. 45°; sampled full thickness) bound by limestone. Sample is silicated limestone, 10% epidote, 20% sphalerite, 2% chalcopyrite. Bottom of resource zone identified in DMA work of early 1950's. Apparently that zone remains in place, un-mined, above this drift.
DR160	Chip	3.5 ft	Abril Mine, level 4 (fig. 28; mine map, fig. 29). Skarn (N. 55° W., NE. 40°, sampled full thickness), 60% altered limestone with green calc-silicates, 30% epidote, 10% limestone of same composition as wallrock. No sulfides observed. Zone does not extend down dip as far north as level 5 DMA drift, based on drilling from level 3 (Owens, 1954?, p. 16). Apparently easternmost extent of main mine skarn on level 4.
DR161	Chip	6 ft	Abril Mine, level 4 (fig. 28; mine map, fig. 29). Skarn (N. 55° W., NE. 40°, sampled full thickness), same zone as DR160; 70% calc-silicate minerals, 20% epidote, 5% sphalerite, 5% limestone, minor chalcopyrite.
DR162	Chip	4.7 ft	Abril Mine, level 4 (fig. 28; mine map, fig. 29). Skarn (N. 50° W., NE. 65°, sampled full thickness) that was mined from stope; 40% calcite, 30% sphalerite, 30% epidote, traces of malachite, pyrite, chalcopyrite. Bound by limestone.

Number	Type	Length	Description
DR163	Chip	2.3 ft	Abril Mine, level 4 (fig. 28; see mine map, fig. 29). Skarn (N. 40° W., NE. 50°, sampled full thickness) at portal; zone disappears into mine back where back meets right rib, but same zone was stoped for ore about 100 ft to SE. on level 3 (see map, fig. 29).
DR164	Chip	5 ft	Abril Mine, level 3 (fig. 28; see mine map, fig. 29); mine inaccessible east of this point due to wide, open winzes, at least 30-ft-deep; rest of map of this level from Mulchay (1948, maps) and Farnham (1954, fig. 3). Skarn (N. 45° W., NE. 53°, sampled full thickness) structure followed in from portal, but this locality is where sulfides are first visible, moving SE. from portal; sample is 90% altered limestone with actinolite and epidote, 10% sulfides, mostly sphalerite, minor chalcopyrite, trace malachite.
DR165	Chip	4 ft	Abril Mine, level 2 (fig. 28; see mine map, fig. 29); lacking ropes, mine inaccessible east of this point, as it drops into stope at 70° for 50+ ft. Skarn (N. 35° E., SE. 70°, sampled basal 4 ft of 10-ft-thick skarn; the rest can't be reached from stope edge), very different orientation from levels 3, 4, 5 skarn. Sample 90% quartz, 10% sphalerite, minor pyrite. On hangingwall, bound by limestone, weak skarn with highly contorted beds. On footwall bound by black, silicified limestone.
DR166	Select	n/a	Abril Mine, level 1 (fig. 1, uppermost level) (see map, fig. 29). Skarn on dump, 80% calc-silicates, enriched in epidote, actinolite, green garnet and 20% silica with sphalerite. Overall, 10% sphalerite in sample. Skarn on this level exhibits *southern* dip, as skarn in level 2 (see map).
DR167	Chip	5 ft	Prospect (fig. 28, 31) SE. of Abril Mine on skarn (N. 60° W., NE. 52°, up to 6-ft-thick). Altered limestone with calc-silicate minerals and epidote, and a 6-in.-thick zone with 20% sphalerite. Total skarn length is 112 ft on strike (in two segments); covered to NW., faulted off to SE.
DR168	Chip	3 ft	Prospect pit, 10 ft by 6 ft, 4-ft-deep, exposes skarn (N. 45° W., NE. 59°, sampled full thickness) that cuts limestone conglomerate; with epidote, unidentified iron-oxide stain, minor sphalerite. On strike, exposed for 30 ft. Pl. 1.

Number	Type	Length	Description
DR169	Chip	7 ft	Prospect pit, 6 ft diameter, 5-ft-deep, exposes skarn (N. 37° W., dip indeterminate); with epidote, unidentified iron-oxide stain, minor chalcopyrite; some magnetite and quartz in exposure but not in sample; exposed on strike for 12 ft. Pl. 1.
DR170	Chip	4 ft	Prospect pit, 5 ft by 6, 3-ft-deep, exposes silicated fracture (N. 5° W., NE. 85°) through limestone breccia; with epidote, limonitic stain, pyrite, chalcopyrite, sphalerite; scattered exposure through cover on strike for 25 ft. Pl. 1.
DR171	Chip	3 ft	Hussar mineral patent (pl. 1; fig. 31); altered (silicated?) and unaltered limestone near fault; hematite. Sample from 1980 RARE II study (Kreidler, 1981, sample 98); pulp re-assayed in 1992.
DR172	Chip	5 ft	Hussar mineral patent (pl. 1; fig. 31); altered limestone near fault; major hematite and limonitic stain, minor malachite, azurite, epidote. Sample from 1980 RARE II study (Kreidler, 1981, sample 97); pulp re-assayed in 1992.
DR173	Chip	5 ft	Prospect, inclined shaft (pl. 1; fig. 31) on skarn (N. 80° E., NW. 75°; sampled full thickness); 90% epidote, 10% altered limestone; limonitic stain, copper-oxide stain.
DR174	Select	n/a	Skarn on dump; major components epidote, altered limestone, copper-oxide stain, unidentified iron-oxide stain. Dump is about 200 st. Pl. 1, fig. 31.
DR175	Select	n/a	Prospect adit (pl. 1, fig. 31); select of 8 st stockpile with silicified, altered limestone displaying limonitic stain, other unidentified iron-oxide stain, epidote, copper carbonate(?) stain. From epidotized fracture through limestone exposed in adit. Dump is about 100 st (at 20 ft^3/st).
DR176	Chip	6 ft	Prospect adit (fig. 19, 24). Skarn along fracture, N. 35° W., dips NE. 65° through limestone; slickensided footwall. Weak calc-silicate mineral (brown) development on lowest 2-ft of footwall side of zone, epidotized (< 2% epidote) punky, limonitic stain. Skarn within fracture zone pinches out about 10 ft in from portal; sampled full width.

Number	Type	Length	Description
DR177	Chip	3.5 ft	Prospect adit (fig. 19; fig. 24, see map DR177-178). Fracture in limestone, N. 65° W., SW. 65°, minor clay gouge and limonitic stain, trace pyrrhotite. Can't trace along strike (no exposure).
DR178	Chip	7 ft	Prospect adit (fig. 19; fig. 24, see map DR177-178). Breccia of quartzite, N. 45° W., SW. 77°, sample of true width. Clean; minor hematite and epidote on fractures in zone. Dump removed for road fill.
DR179	Chip	15 ft	Small adit, fig. 19, 24. Skarn, irregular orientation, generally trends NE., dips SE. Covered to NE. (soil), faulted off to south. Total width is 15 to 20 ft. Dump barren, size negligible.
DR180	Chip	21 ft	Prospect adit (fig. 19; fig. 24, see map DR180-182). Limestone, siliceous, dark gray, fractured (numerous orientations), yellow-clay gouge and limonitic stain on some fractures, laminar carbonate and silica zones, 0.5-in.-thick to 1-in.-thick. A check for metallization in extensive fractured, silicified zone. Extent beyond face not known.
DR181	Chip	4.5 ft	Skarn through silicified limestone, N. 20° W., SW. 35°, brown calc-silicates, epidote, secondary calcite, minor limonitic stain. True thickness about 6 ft (bad back in this zone). Can't trace to SE. (thick vegetation on surface); eroded to NW. Fig. 19, 24.
DR182	Grab	n/a	Limestone, silicified, brecciated, light gray, with silica and calcite cements, calcite clasts. Grab from dump of rock occurring inside portal area (bad back there). Dump scattered down steep hillside with very heavy brush. No measurement possible. Fig. 19, 24.
DR183	Chip	5 ft	Prospect adit (fig. 19; fig. 24, see map DR183). Skarn, N. 10° E., SE. 34°, in silicified, brecciated limestone. Exposed for 20 ft on strike; does not continue to SW., covered to NE. Weak skarn, mostly epidotized limestone; minor epidote. limonitic stain. No enriched rock on dump, about 80 st.
DR184	Select	n/a	Prospect pit, 10 ft X 6 ft, 2-ft-deep. Soil, talus obliterate structural trends. Weakly epidotized, silicified limestone, leached, stained by unidentified iron oxides. Fig. 19.

Number	Type	Length	Description
DR185	Chip	not record-ed	Selected quartz and epidote veinlets (with goethite) in skarn zone adjacent to rhyolite porphyry. Fig. 19.
DR186	Chip	4 ft	Prospect adit (fig. 19; fig. 24). Skarn zone along fracture, N. 47° W., vertical, hosted by acid igneous rock within Pinal Schist Formation. Skarn has minor pyrite (<1%). Dump is barren, about 500 st. In host rock, feldspars in part converted to diopside.
DR187	Chip	not record-ed	Weathered outcrop and subcrop (fig. 19) of suspected skarn; specular hematite, oxidized magnetite and hematite, epidote, fluorite. Outcrop area about 30 ft by 30 ft.
DR188	Chip	4 ft	Skarn, N. 30° W., SW. 60°; 60% altered limestone, 40% green-brown calc-silicate, 10% epidote. Hangingwall is sandstone and shale, footwall is probably limestone (footwall contact buried). May be thicker than exposure. Can't trace on strike (cover). Fig. 19.
DR189	Chip	5 ft	Skarn, N. 55° E., SE. 42°, through limestone (fig. 19). Skarn pinches out within 50 ft to north, extends 35 ft to south (DR190). At collar of 20-ft-deep shaft. Zn reported (16%). Nearly all of dump removed for road fill; a few pieces of sphalerite/epidote and malachite/azurite on dump.
DR190	Select	n/a	Same site as DR189. Sample from 2 st dump: skarn with epidote, malachite, azurite, magnetite. Skarn covered S. of DR190. Fig. 19.
DR191	Grab	n/a	Sample from dump of prospect pit (fig. 19); pit dimensions not recorded. Sample from USBM 1980 RARE II study (Kreidler, 1981, sample 107); pulp re-assayed in 1992. Fig. 19.
DR192	Chip	8 ft	Prospect adit (probably the "Cave adit", fig. 19), 6-ft-long, trends N. 30° E., exposing antiform skarn (3 ft) and meta-shale (5 ft). Shale enriched in epidote and limonitic stain. Adit cuts crest of anticline (N. 30° E., plunging SW. 55°. This is N. extent of skarn; continues S. to DR193.
DR193	Chip	25 ft	Skarn (sampled full thickness), N. 40° W., SW. 45°, epidote and minor malachite; cuts quartzite (black) with anastomosing, white quartz veinlets. Location is 27 ft south of DR192. Fig. 19.

Number	Type	Length	Description
DR194	Chip	3 ft	"Copper" adit, N. 86° W., 21-ft-long, plus 12-ft-long open cut at portal (same bearing). Cuts fault-controlled (N. 60° E., NW. 66°) skarn pod in limestone. Skarn is thin, green-brown calc-silicates, minor malachite; skarn pinches out up dip, and is talus-covered down dip. Extension of DR192-193 (122 ft total strike length). Fig. 19.
DR195	Chip, verti-cal	7.5 ft	San Juan Mine, Sulphide adit (see map, fig. 20). Skarn, top of 8- to 10-ft-thick zone, brown-green calc-silicates, actinolite, siderite. Westernmost exposure of skarn on this level.
DR196	Chip	9 ft	Sulphide adit (see map, fig. 20). Skarn (sampled full width), N. 70° E., SE. 44°, mostly brown-green calc-silicates, but upper 4 ft is layers of thin skarn and of fractured marble.
DR197	Chip, verti-cal	3 ft	Sulphide adit (see map, fig. 20); skarn. Sample from USBM 1980 RARE II study (Kreidler, 1981, sample 106); pulp re-assayed in 1992.
DR198	Chip	5.5 ft	Sulphide adit (see map, fig. 20). Skarn, N. 50° W., SW. 20°, but orientation varies; calc-silicates, moderate epidote, *no visible sphalerite*. Sampled only top of zone; full thickness not exposed.
DR199	Chip	5 ft	Sulphide adit (see map, fig. 20). Skarn, fractured, N. 45° E., SE. 48°; minor sphalerite (<2%). Other skarn (greater density) on footwall; full skarn thickness not exposed.
DR200	Select	n/a	Skarn from dump of Sulphide adit (see map, fig. 20), approximately 30 st part of dump.
DR201	Grid	n/a	Representative dump sample from Sulphide adit (see map, fig. 20), quartzite with minor epidote, sphalerite, minor skarn; from 700 st part of dump.
DR202	Chip	10 ft	Burro adit (see fig. 19), trends N. 78° W. for 17 ft. Sampled full thickness of skarn with epidote at portal (N. 45° W., SW. 53°), which is probably extension of Sulphide adit zone; covered beyond portal area.

Number	Type	Length	Description
DR203	Grid	n/a	Prospect adit, N. 30° W. for 35 ft (fig. 19, no map), exposing quartz veinlet zone, N. 59° W., SW. 29° (thickness not recorded) with pyrite, malachite, chrysocolla, that cuts silicified limestone (strike length not recorded). Possible bedding control of veinlets. Representative dump sample of all material.
DR204	Grab	n/a	Prospect adit, N. 65° W. for 15 ft (fig. 19, no map), along bedding (?) plane in limestone that dips NE. 70°. Representative of rock on entire dump.
DR205	Grab	n/a	San Juan Mine (intermediate level between Silver adit (lower) and Sulphide adit (upper) (see map, fig. 20). Skarn, backfall from stope, brown-green calc-silicate minerals, with major calcite, siderite, hematite, magnetite, epidote. Clayey with limonitic stain. Sampling hampered by bad back conditions; the in place material is 14-ft-thick. A check for mineral tenor of stoped material on this level.
DR206	Chip	3 ft	San Juan Mine (intermediate level between Silver adit (lower) and Sulphide adit (upper) (see map, fig. 20). Weathered skarn, zone probably 8-ft-thick (top unreachable); secondary zinc mineral (smithsonite?), garnet.
DR207	Chip	3 ft	San Juan Mine, Silver adit (see map, fig. 20). Perimeter of mined skarn, 8-ft-thick (top unreachable), N. 15° E., SE. 25°; silicified, garnet. About 10% of sample is metallized.
DR208	Chip	3 ft	San Juan Mine, Silver adit (see map, fig. 20). Skarn, major sphalerite, galena. Sample from USBM 1980 RARE II study (Kreidler, 1981, sample 102); pulp re-assayed in 1992.
DR209	Grid	n/a	San Juan Mine, dump of inclined raise to surface (see map, fig. 20). Representative sample of epidotized limestone. Dump is about 80 st.
DR210	Chip	4 ft	San Juan Mine, Silver adit (see map, fig. 20). Skarn, with moderate sphalerite, galena, minor malachite. Sample from USBM 1980 RARE II study (Kreidler, 1981, sample 101); pulp re-assayed in 1992.

Number	Type	Length	Description
DR211	Grab	n/a	San Juan Mine, Silver adit (see map, fig. 20). Enriched pocket (pyrite, sphalerite, 10% total sulfides), in 20 ft-thick skarn; grab from sloughed pillar due to bad back conditions in mine.
DR212	Chip	60 ft	San Juan Mine, Silver adit (see map, fig. 20). Vertical fracture zone (6 in.- to 8 in.-thick) extending NE. along drift from minable skarn thickness; silication along fracture (calcite-rich, garnet, siderite, actinolite, no visible sulfides.
DR213	Chip	4 ft	San Juan Mine, Silver adit (see map, fig. 20). Skarn perimeter, with moderate sphalerite, barite, galena, chalcopyrite. Sample from USBM 1980 RARE II study (Kreidler, 1981, sample 104); pulp re-assayed in 1992.
DR214	Chip	4 ft	San Juan Mine, Silver adit (see map, fig. 20). Skarn, N. 40° W., NE. 14°, with galena, limonitic stain. Sample from USBM 1980 RARE II study (Kreidler, 1981, sample 103); pulp re-assayed in 1992.
DR215	Chip	5 ft	San Juan Mine, Silver adit (see map, fig. 20). Area of unidentified iron-oxide staining, that dips E. about 15°.
DR216	Grid	n/a	San Juan Mine, Silver adit (see map, fig. 20). Representative dump sample, of silicified, epidotized limestone. Dump about 500 st.
DR217	Grid	n/a	San Juan Mine, Mann adit (see composite map of San Juan Mine, fig. 20); badly caved portal, not caved shut but inaccessible. Representative sample from dump of silicified, epidotized limestone. Dump about 70 st.
DR218	Chip	1 ft	Blende adit, prospect of San Juan Mine (see map DR218-219, fig. 22; also fig. 19). Fracture (sampled full width), E.-W., dips S. 57°, highly silicified, of quartzite and limestone, limonitic stain, minor malachite; cuts silicified limestone bedrock.
DR219	Chip	3.5 ft	Skarn, N. 60° E., SE. 25°, on which adit was initially driven; green-brown calc-silicates, calcareous, silicified, minor limonitic stain and epidote. True thickness unknown (footwall never excavated). Most of strike length excavated by road (to W.) or eroded (to E.); poor outcrop exposure. Fig. 19, 22.

Number	Type	Length	Description
DR220	Chip	45 ft	San Juan Mine area, fig. 19. Skarn outcrop, N. 30° to 40° W., SW. 30° to 50°, highly silicified, moderate epidote, trace malachite. Same as DR221 zone (Mistletoe adit), 10 ft to S., and may extend to N. to area of DR192-194 (was not traced through heavy talus cover to those sites).
DR221	Chip	5.5 ft	Mistletoe adit (prospect of San Juan Mine; fig. 19, see mine map, fig. 23). Southern extent of DR220 skarn (and possibly of DR192-194 skarn), N. 50° W., SW. 60°; highly silicified with two quartz phases (50% of sample, one black, one white), 50% skarn, with brown-green calc-silicates, minor epidote, yellow garnet, and malachite, trace pyrite. Full thickness of skarn not excavated here; it is greater than 5.5 ft thick (see sample DR220).
DR222	Grid	n/a	Mistletoe adit dump, fig. 19, representative sample of epidotized, garnetiferous (green garnets) limestone.
DR223	Chip, verti-cal	4 ft	Prospect adit DR223-224 of San Juan Mine (fig. 19, no map), N. 18° E., for 18 ft, exposes fracture in skarn (E.-W., S. 60°) (sampled full thickness); minor sphalerite. Strike length not exposed.
DR224	Chip	not re-corded	Prospect adit DR223-224 of San Juan Mine (fig. 19, no map). Sulfide-enriched pod at portal, trends N 68° W., dips NE. 70°, 2% sphalerite, continues on strike for 10 ft to cover.
DR225	Chip	2 ft, horizon-tal	Prospect shaft (5 ft X 5 ft, 6-ft-deep, sloughed in) of San Juan Mine (see fig. 19), exposing N.-S. fracture (E. 60°), that continues N. on strike for 30 ft to 40 ft. Sample of skarn in fracture zone, minor epidote. Minor malachite on dump; dump size about 20 st.
DR226	Chip	1.5 ft	Open cut prospect (N. 30° W. for 25 ft, 8 ft across, 6 ft deep) of Muheim Mine area (see fig. 19) exposing skarn, N. 60° E., SE. 20°, 2-ft-thick total, moderate silicification, epidote. Strike length not recorded by field geologist. Dump is about 30 st, not enriched.

Number	Type	Length	Description
DR227	Chip	3 ft	Prospect adit, Muheim property (fig. 19; see map DR227-233, fig. 27). Fault, N. 40° W., SW. 43°, through limestone (sampled full thickness); pyrite stringers and disseminated pyrite (total sulfides: 5% to 8%). Fault zone, silicified, black, no carbonate. Sulfide grains are small (< 1mm across to 1 mm across), fresh; possible trace chalcopyrite. Malachite (?) stain (minor).
DR228	Chip	3.5 ft	Prospect adit, Muheim property (fig. 19; see map DR227-233, fig. 27). Fault, N. 42° W., NE. 85°, through limestone/marble (sampled full thickness); fault zone is dark gray silicified limestone with 1/8-in.-thick pyrite stringers (<5% total sulfides), minor malachite; possible secondary zinc on ribs.
DR229	Chip	3.5 ft	Prospect adit, Muheim property (fig. 19; see map DR227-233, fig. 27). Skarn, N. 85° W., SW. 22°, weak development of calc-silicate minerals, major epidotized limestone. Total thickness not exposed (not excavated in back).
DR230	Chip	7 ft	Prospect adit, Muheim property (fig. 19; see map DR227-233, fig. 27). Skarn, apparently horizontal here; carbonate-rich; bottom 3 ft gougey, 60% epidote; middle 1 ft limestone; upper 3 ft is 1/2 epidote-rich skarn, 1/2 limestone.
DR231	Chip	7 ft	Prospect adit, Muheim property (fig. 19; see map DR227-233, fig. 27). Skarn, apparently horizontal here; carbonate-rich, 60% epidote, gougey; parts are 1/2 limestone blocks (probable fault control of this southern contact of skarn), but were not sampled. Enclosing bedrock to south is limestone/quartzite.
DR232	Grid	n/a	Prospect adit, Muheim property (fig. 19; see map DR227-233, fig. 27). Representative sample of north half of dump.
DR233	Grid	n/a	Prospect adit, Muheim property (fig. 19; see map DR227-233, fig. 27). Representative sample of south half of dump. Total dump size about 600 st.
DR234	Chip	25 ft	Prospect adit, Muheim property (fig. 19, no map), trends S. 75° E. for 20 ft on skarn, then south for 25 ft, mostly in skarn. Very bad back, ribs; not safe to enter. Sampled skarn (N. 85° W., vertical) at portal; probably a down-dip extension of DR236.

Number	Type	Length	Description
DR235	Grid	n/a	DR234 adit dump (fig. 19), representative of rock on half of dump closest to adit.
DR236	Chip	20 ft	Muheim Mine, upper open cut (fig. 19; see map DR236-239, fig. 26). Skarn (sampled full thickness), N. 35° W., SW. 64°; 40% silica, 40% green-brown calc-silicates, 20% epidote-rich gouge. Slickensides parallel strike. Covered to E., eroded uphill and to W. Exposed down dip at DR234.
DR237	Grid	n/a	Muheim Mine, dump of upper open cut (fig. 19; see map DR236-239, fig. 26). Skarn with epidote, limestone fault breccia, quartzite or silicified limestone. Northwest half of dump.
DR238	Grid	n/a	Muheim Mine, dump of upper open cut (fig. 19; see map DR236-239, fig. 26). Same mineralogy as DR237. Southeast half of dump.
DR239	Grid	n/a	Muheim Mine, dump of adit (fig. 19; see map DR236-239, fig. 26). Skarn with epidote, quartzite or silicified limestone.
DR240	Chip	4 ft	Lulty prospect adit, N. 84° W., 8-ft-long, 1,000 ft SE. of Muheim Mine (see fig. 19); exposes skarn (full thickness sampled), N. 74° W., SW 40°, with epidote enrichment on hangingwall. Also, 12-ft-long trench outside portal. Can't trace along strike to W. (no exposure). Small dump, about 10 st.
DR241	Chip	15 ft	Skarn, N. 50° W., NE. 85°, exposed in bulldozer cut, 1,000 ft SE. of Muheim Mine (see fig. 19); sampled minimum thickness (footwall lost in talus); 2/3 is brown-black calc-silicates with epidote, 1/3 is epidotized, silicified limestone with light green calc-silicate zones. Footwall is 5-ft-thick wollastonite skarn (not sampled). Granitic dike 25 ft to E. Can't trace on strike (soil cover).
DR242	Chip	12 ft	Skarn, N. 20° W., NE. 85°, exposed in bulldozer cut, 1,000 ft SE. of Muheim Mine (see fig. 19); sampled full thickness; brown-green calc-silicates, moderate epidote. Hangingwall is marble, footwall is 12 ft thickness of weakly silicated rock (not sampled). Exposed 35 ft up dip at DR241 bulldozer cut (less than 100 ft along strike), then covered by soil beyond.

Number	Type	Length	Description
DR243	Chip	17 ft	Skarn, N. 50° W., NE. 85° to vertical, exposed in bulldozer cut, 1,000 ft SE. of Muheim Mine (see fig. 19); sampled full thickness; 3/4 brown-black calc-silicates, 1/4 epidotized, silicified limestone. Footwall, hangingwall marble. Extends S. for 50 ft on strike, then lost in hillside. Same skarn as DR241, about 100 ft on strike from DR241: total strike length about 150 ft exposed.
DR244	Chip	4 ft	Prospect NE. of caved Sorin Camp Mine (fig. 25). Barren drift in limonite-stained quartzite. Sampled full thickness of minor zone of epidote staining on quartzite "bedding", (bedding N. 25° E., SW. 65°).
DR245	Select	n/a	Prospect pit, 8 ft X 8 ft, 4 ft deep; small skarn occurrence in lower Paleozoic limestone (light gray) within 200 ft of Stronghold batholith. Sample of remaining skarn, with magnetite, secondary copper and iron stain. Fig. 14.
DR246	Select	n/a	Cobre Loma Mine (fig. 14; see map, fig. 16); stoped skarn; 70% epidotized limestone, 25% magnetite, 5% chalcopyrite and pyrite. Possibly representative of ore mined in 1915 and earlier. Probably more stoping to SE., but can't access (flooded winze, *bad* mine back).
DR247	Chip	5 ft, vertical	Cobre Loma Mine (fig. 14; see map, fig. 16); fault contact along which ore zone formed. Granite (80% of sample) with 3 in.- to 8-in.-thick interfingerings of epidotized, fine-grained limestone. Granite likely supplied heat for skarn formation.
DR248	Chip	5 ft, vertical	Cobre Loma Mine (fig. 14; see map, fig. 16); epidotized limestone, 2% to 5% sphalerite in hand specimen, minor pyrrhotite and chalcopyrite; in 5-ft-thick fault zone. Minor sulfide enrichment here, but considerable enrichment on same fault zone by sample DR246 (stope).
DR249	Chip	27 in.	Cobre Loma Mine (fig. 14; see map, fig. 16); fault through Bisbee Group shale (thrust fault zone of Drewes and Meyer (1983, map), N. 46° E., dips NW. 73°. Disrupts shale bedding, which is N. 70° W., SW. 53° on NW. side of fault, and is N. 75° E., SE. 85° on SE. side of fault. Gouge of shale. Slickensides. No metallics.

Number	Type	Length	Description
DR250	Chip	3 ft	Cobre Loma Mine (fig. 14; see map, fig. 16); fracture zone through shale, N. 47° W., dips SW. 62° to 65°, iron-oxide-stained. Mine was started on this structure (thins and disappears into SW. rib). All shale, no metallics.
DR251	Chip	20.5 ft	Lloyd and Laverns (fig. 14). Sampled full thickness of skarn through limestone breccia, oriented N. 60° W., dips NE. 31°, composed of green/brown calc-silicates, moderate limonitic stain, weathered pyrite, carbonate-enriched. Two 4 in.- to 6 in.-thick clay zones (yellow gouge) in sample.
DR252	Chip	9.5 ft	"Bill's Cut" (fig. 14). Sampled full thickness of skarn, oriented N. 5° W. to N. 10° W., dips SW. 25° to 35°. Chloritically-altered, Tertiary, granitic rock on hangingwall; black shale (upper Bisbee Group) on footwall. Shale (<1 ft) between hangingwall and skarn. Skarn: brown calc-silicates, major actinolite, moderate limonitic stain, minor malachite stain. *Cobre Loma mineralization trend.*
DR253	Chip	9 ft	"Bill's Cut" (fig. 14), at southern extent, 20 ft SE of DR252. Natural exposure. A *second* skarn zone (first is DR252), N. 40° W., dips SW. 75°, of dark green calc-silicates, with laminations of epidotized limestone. Footwall is 1 ft shale, then granitic rock; 20 ft SE. of footwall is quartz-monzonite porphyry. Hangingwall is granitic rock (as in DR252), but with exotic block of black shale on fault contact. *Cobre Loma mineralization trend.*
DR254	Chip	13 ft	"McDaniel's Cut" (fig. 14), exposes skarn, 20-ft-thick, N. 40° W., dips SW. 68°. Missed 7 ft of skarn in sample due to unstable highwall. Sample: green/brown calc-silicate, minor malachite and limonitic stain, with 3-ft-thick epidote-rich zone near hangingwall; includes 1 ft quartz-monzonite porphyry. *Cobre Loma mineralization trend.*
DR255	Chip	16 in.	Prospect adit (fig. 14) intersects fault contact with shale, limestone, 77 ft in from original portal. Fault: N. 76° W., dips SW. 82°, sampled entire thickness with DR255. Sample: black shale, with minor clay, jarosite, slickensides, and moderate limonitic stain. A splay of fault zone controlling *Cobre Loma mineralization trend.*

Number	Type	Length	Description
DR256	Chip	5.3 ft	Ella prospect (fig. 14). Sample: skarn, full thickness, oriented N. 50° W., dips SW. 42°, at inclined shaft collar, major epidotized porphyry and limonitic clay, minor malachite; gossany-appearing weathered surface. Skarn enclosed by quartz-feldspar porphyry, gray, fine-grained.
DR257	Select	n/a	Ella prospect dump (fig. 14). High-grade sample of skarn, enriched in epidote, chlorite, and much more dense than sample DR256.
DR258	Chip	7 ft	Pit, part of Ella workings (fig. 14). Sample: skarn, full thickness, oriented N. 60° W., dips SW. 50°; gossany and weathered, major goethite, minor malachite; enclosed by rhyolite porphyry that is likely late Tertiary in age. *Continuation of Cobre Loma mineralization trend.*
DR259	Chip	20 ft	Bulldozer cut (fig. 14) exposes skarn, N. 10° W., dips irregular; sampled full thickness; enclosed by marbleized conglomerate (Glance Conglomerate?) and rhyolite porphyry. *Continuation of Cobre Loma mineralized zone.*
DR260	Chip	25 ft	Silver Hill prospect (fig. 14). Skarn, N. 30° W. to N. 40° W., dips SW. <80°; dark green, silicified, carbonate poor even though hosted by limestone (upper Bisbee Group), minor limonitic stain; sampled full thickness. Skarn cut by rhyolite porphyry dikes.
DR261	Chip	25 ft	Outcrop (fig. 14), SE. extent of exposed Silver Hill skarn, oriented N. 25°W., dips SW. 80+°; mostly buried in talus. Sample: dark green-to-black silicified rock, moderate epidote and limonitic staining, but *not* enriched in the massive occurrences of brown-green calc-silicate minerals common in Middlemarch Canyon. Cuts limestone (upper Bisbee Group?) only.
DR262	Select	n/a	Pit (fig. 14). No geology exposed. Sample: representative of all material on skarn stockpile from this pit; skarn of same mineralogy as Middlemarch Mine. Dump is 400 st. No obvious leaching of sulfides from dump.
DR263	Select	n/a	Open cut on skarn (fig. 14), flooded (see DR264). Sample representative of all skarn in stockpile immediately NE of open cut, which contains about 2,000 st; same skarn mineralogy as Middlemarch Mine.

Number	Type	Length	Description
DR264	Chip	35 ft	Open cut on skarn (fig. 14). Sample: segment of skarn zone (N. 40° W., dips SW. 70° to 80°) accessible from south rim of cut; skarn texture, color, resembles Middlemarch Mine skarn but is less siliceous; DR 264 is calcareous, with major quartz, epidote, actinolite, limonitic stain; minor manganese oxide; hosted in limestone conglomerate (Glance Conglomerate?), also overlain by same conglomerate, possibly along low-angle fault contact. Innes and Assoc. (1982, p. 14-15) describe quartz monzonite porphyry on west contact of skarn.
DR265	Chip	3 ft	Skarn (fig. 14), due N. strike, dips E. 20°, in roadcut; sampled total thickness; minor epidotization of limestone cobble breccia. Possible fringe zone of DR262-264 skarn.
DR266	Chip	6 ft	Gouge zone (fig. 14), due N. strike, dips E. 68°, in roadcut; sampled total thickness; fault through calcareous cobblestone conglomerate, 48 ft SW. of DR265. A check for precious metals deposition in faults around the skarn area.
DR267	Chip	30 ft	Open cut (fig. 14), exposes fault, oriented N. 45° W., dips SW. 80°, with marbleized cobble conglomerate on hangingwall and fine-grained sandstone(?), minor epidote, on footwall. Sample: sandstone (?) from fault footwall to mouth of open cut. No skarn formed here.
DR268	Chip	20 ft	Open cut (fig. 14; see DR267). Sample: marble conglomerate (18.5 ft), plus 1.5 ft gouge zone of fault (all rock between face of cut and the fault).
DR269	Grid	n/a	Shaft (fig. 14). Sample from USBM 1980 RARE II study (Kreidler, 1981, sample 99); pulp re-assayed in 1992. Mineralized zone not visible; rock on dump suggests skarn at granitic rock/limestone contact with major hematite and limonitic stain. Sample: representative of all rock on dump.
DR270	Grab	n/a	Shaft (fig. 14). Sample from USBM 1980 RARE II study (Kreidler, 1981, sample 100); pulp re-assayed in 1992. Diabase dike through granite (Precambrian, according to Drewes and Meyer, 1983, map), N. 80° E., vertical, major manganese and iron oxide staining, moderate epidote, minor malachite, azurite.

Number	Type	Length	Description
DR271	Chip	4 ft	Prospect adit (fig. 14; see map, fig. 18). Sample from USBM 1980 RARE II study (Kreidler, 1981, sample 111); pulp re-assayed in 1992. Sample: "highly altered intermediate volcanic rock". Likely late Tertiary rhyolite intrusive along fault in Bisbee Group or in lower Paleozoic rocks, a geologic occurrence common in Middlemarch Canyon.
DR272	Chip	4 ft	Same as sample DR271 (fig. 14, 19); numbered 112 in Kreidler (1981). Pulp re-assayed in 1992. See map.
DR273	Chip	3 ft	Same as samples DR271-272 (fig. 14, 19); numbered 113 in Kreidler (1981). Pulp re-assayed in 1992. See map.
DR274	Chip	4 ft	Same as samples DR271-273 (fig. 14, 19); numbered 114 in Kreidler (1981). Pulp re-assayed in 1992. See map.
DR275	Select	n/a	Emma adit (fig. 14). Sample from dump is representative skarn, silicified, vuggy in part, enriched in hematite; malachite and limonitic stain. Skarn of dark green/light green calc-silicate minerals and quartz. Not seen in place; orientation unknown.
DR276	Chip	270 ft	Middlemarch flotation mill tailings (fig. 14). Across length of tailings pile surface, sampling every 10 ft. No dam for tailings was ever built.
DR277	Chip	5 ft	Middlemarch flotation tailings (fig. 14). Represents full thickness, vertical section through tailings pile (via natural erosion gully).
DR278	Chip	30 ft, horizontal	Perimeter of mined zone in Middlemarch Mine, 4th Level (fig. 14, 15). Skarn, siliceous (not calcareous), with major epidote, magnetite; minor limonitic stain. Missed 5 ft of total occurrence (35 ft) due to timbering. Mahoney (1942a, p. 4, fig. 1) broke the SW. 25 ft of this interval into 5 horizontal, 5 ft chip samples (from SW to NE): sample 566 with 0.36% Cu. 0.8% Zn; sample 565 with 0.45% Cu, 5.7% Zn; sample 564 with 0.83% Cu, 12.1% Zn; sample 563 with 0.36% Cu, 4.1% Zn; sample 562 with 0.06% Cu, 1.6% Zn. DR278 confirms elevated Cu (>1%) and Zn (>3%), and presence of silver (1.3 oz/st).

Number	Type	Length	Description
DR279	Chip	8 in.	Middlemarch Mine, 4th Level (fig. 14, 15). Fault zone in limestone; sampled full thickness; N. 32° W.,vertical to dipping 70° NE. Gouge of limestone, minor limonitic stain, <1% pyrite. A check for precious metals deposition in fractures near breccia pipe. Limestone has numerous, quartz-rich, porphyry-filled veinlets, enhancing hypothesis of pervasive alteration by late Tertiary-age, porphyritic, intrusive, mineralizing agent.
DR280	Chip	1 ft	Middlemarch Mine, 4th Level (fig. 14, 15). Fault in limestone; sampled full thickness; N. 37° W., vertical. Gouge of limestone, epidotized, limonitic stain, calcite, <1% pyrite. A check for precious metals deposition in fractures near breccia pipe.
DR281	Chip	1 ft	Middlemarch Mine, 4th Level (fig. 14, 15). Fault in silicified limestone; sampled full thickness; N. 35° W., dipping NW. 80°. Gouge of dolomitic rock and limonite-stained clay. A check for precious metals deposition in fractures near breccia pipe.
DR282	Select	n/a	Middlemarch Mine, outside 4th Level portal (fig. 14). High-grade of copper-sulfide enriched dump.
DR283	Grab	n/a	Skarn from Missouri Shaft (glory hole). Fig. 14.
DR284	Grab	n/a	Prospect pit (fig. 14), exposes rhyolite, which was sampled. Sample from USBM 1980 RARE II study (Kreidler, 1981, sample 94); pulp re-assayed in 1992. Likely NW. trending, late Tertiary rhyolite intrusion of Drewes and Meyer (1983, map), the mineralizing agent in Middlemarch Canyon area.
DR285	Chip	3 ft	Prospect adit DR285-295 (fig. 14; see map, fig. 17). From USBM 1980 RARE II study (Kreidler, 1981, sample 92); pulp re-assayed in 1992. Sample of "limonitic-stained zone". Meta-shale(?) (see Anaconda Geol. Document Collection, Middlemarch, "South adit" map, 1956); probably Bisbee Group rocks. Metamorphism likely from Drewes and Meyer's (1983, map) late Tertiary intrusive, the mineralizing agent in Middlemarch Canyon area.

Number	Type	Length	Description
DR286	Chip	3 ft	See map (fig. 14; DR285-295 adit, fig. 17). From USBM 1980 RARE II study (Kreidler, 1981, sample 90); pulp re-assayed in 1992. Sample of "fault gouge, major hematite, limonitic stain". Meta-shale(?) (see Anaconda Geol. Document Collection, Middlemarch, "South adit" map, 1956); probably Bisbee Group rocks. Metamorphism likely from Drewes and Meyer's (1983, map) late Tertiary intrusive, the mineralizing agent in Middlemarch Canyon area.
DR287	Chip	4 ft	See map (fig. 14; DR285-295 adit, fig. 17). From USBM 1980 RARE II study (Kreidler, 1981, sample 89); pulp re-assayed in 1992. Sampled fault contact, brecciated, of limestone and meta-shale(?) (see Anaconda Geol. Document Collection, Middlemarch, "South adit" map, 1956). Metamorphism likely from Drewes and Meyer's (1983, map) late Tertiary intrusive, the mineralizing agent in Middlemarch Canyon area which envelopes the Bisbee Group carbonates.
DR288	Chip	4 ft	See map (fig. 14; DR285-295 adit, fig. 17). From USBM 1980 RARE II study (Kreidler, 1981, sample 88); pulp re-assayed in 1992. Sample: fault plane in limestone also containing fine-grained rock [meta-shale(?)] (see Anaconda Geol. Document Collection, Middlemarch, "South adit" map, 1956). Bisbee Group carbonates.
DR289	Chip	4 ft	See map (fig. 14; DR285-295 adit, fig. 17). From USBM 1980 RARE II study (Kreidler, 1981, sample 87); pulp re-assayed in 1992. Sample: brecciated fault gouge in intrusive; minor iron-oxide stain. Likely Drewes and Meyer's (1983, map) late Tertiary intrusive, the mineralizing agent in Middlemarch Canyon, which envelopes Bisbee Group carbonates. A check for precious metals deposition along alteration zones in intrusive.

Number	Type	Length	Description
DR290	Chip	4 ft	See map (fig. 14; DR285-289 adit, fig. 17). From USBM 1980 RARE II study (Kreidler, 1981, sample 86); pulp re-assayed in 1992. Sample: brecciated fault gouge between DR289 intrusive and meta-shale(?) (see Anaconda Geol. Document Collection, Middlemarch, "South adit" map, 1956); minor limonitic stain. Likely Drewes and Meyer's (1983, map) late Tertiary intrusive, enveloping Bisbee Group carbonates. A check for precious metals deposition along faults in intrusive, the mineralizing agent in Middlemarch Canyon.
DR291	Chip	4 ft	See map (fig. 14; DR285-295 adit, fig. 17). From USBM 1980 RARE II study (Kreidler, 1981, sample 85); pulp re-assayed in 1992. Sample: "brecciated fault gouge". Meta-shale(?) (see Anaconda Geol. Document Collection, Middlemarch, "South adit" map, 1956). Bisbee Group.
DR292	Chip	4 ft	See map (fig. 14; DR285-295 adit, fig. 17). From USBM 1980 RARE II study (Kreidler, 1981, sample 84); pulp re-assayed in 1992. Sample: sheared contact of limestone and granitic rock; no visible metallization. Likely Drewes and Meyer's (1983, map) late Tertiary intrusive, enveloping Bisbee Group carbonates. Intrusive is mineralizing agent in Middlemarch Canyon area. These carbonate/intrusive contacts often were faulted, and can be the loci of copper-zinc metallization in the Middlemarch Canyon area.
DR293	Chip	4 ft	See map (fig. 14; DR285-295 adit, fig. 17). From USBM 1980 RARE II study (Kreidler, 1981, sample 83); pulp re-assayed in 1992. Sample: fault in granitic rock; minor sphalerite, malachite, hematite; slickensides. Likely Drewes and Meyer's (1983, map) late Tertiary intrusive, enveloping Bisbee Group carbonates. Intrusive is mineralizing agent in Middlemarch Canyon area. A check for precious metals deposition along fractures in intrusive.

Number	Type	Length	Description
DR294	Chip	4 ft	See map (fig. 14; DR285-295 adit, fig. 17). From USBM 1980 RARE II study (Kreidler, 1981, sample 82); pulp re-assayed in 1992. Sample: fault in granitic rock; minor chalcopyrite, sphalerite, malachite, azurite, hematite. Likely Drewes and Meyer's (1983, map) late Tertiary intrusive, enveloping Bisbee Group carbonates. Intrusive is mineralizing agent in Middlemarch Canyon area. A check for precious metals deposition along fractures in intrusive.
DR295	Chip	4 ft	See map (fig. 14; DR285-295 adit, fig. 17). From USBM 1980 RARE II study (Kreidler, 1981, sample 79); pulp re-assayed in 1992. Sample: skarn zone in fault through felsic intrusive; sphalerite. Likely Drewes and Meyer's (1983, map) late Tertiary intrusive, enveloping Bisbee Group carbonates. Intrusive is mineralizing agent in Middlemarch Canyon area. A check for metal tenor in minor skarn development on western side of Middlemarch Canyon area.
DR296	Select	n/a	Prospect pit (fig. 14; size not known) on skarn; Sample: high-grade of skarn; major pyrite, chalcopyrite, bornite. Likely Bisbee Group carbonates.
DR297	Grid	n/a	"Christmas" prospect (fig. 14), not to be confused with the economic deposit in Arizona by that same name. Caved adit, at least 20 ft long. Representative sample of all granitic rock on dump.
DR298	Grid?	n/a	Noonan Canyon prospect (no map; see DR299, pl. 1); representative? sample of colluvium and alluvium excavated by bulldozer: diopsidic marble, skarn, limestone colluvium.
DR299	Select	n/a	Noonan Canyon prospect (see DR298. pl. 1); selected quartz-feldspar porphyry colluvium from bulldozer excavation; has local pyrite.
DR300	Chip	4 ft	Small open cut (fig. 32; no map) exposes skarn, N. 44° W., dip concealed; intermittent outcrop through talus suggests 100+ ft of strike length, width possibly 6-ft to 8-ft, poor exposure. Sample calc-silicates, epidote-rich, with unidentified iron-oxide stain.
DR301	Grab	n/a	Standard Tungsten Mine, northernmost shaft (see fig. 32). Linear replacement zone in limestone, with local pyrite. See DR303, taken during a later examination of same shaft.

Number	Type	Length	Description
DR302	Grid	n/a	Standard Tungsten Mine, northernmost shaft (see fig. 32). Same shaft as DR301. Sample from USBM 1980 RARE II study (no. 109 in Kreidler, 1981); pulp re-assayed in 1992. Shaft collar 10-ft by 7-ft, depth could not be determined. Sample: limestone; no structure recognized.
DR303	Grid	n/a	Standard Tungsten Mine, northernmost shaft (see fig. 32). Same shaft as DR301-302. Same sample site as DR302. Shaft estimated as 50?-ft-deep. Structure in shaft noted as N. 38° W., NE. 85°. Dump described as light-gray, fine-grained marble; contains about 100 st.
DR304	Chip	5 ft	Standard Tungsten Mine, trench in NE. part of property (see fig. 32), 30-ft-long, 4-ft-deep, 6-ft-wide, exposing diopside marble, silicified with bedding orientation: N. 22° W., SW. 45°. Sample perpendicular to bedding.
DR305	Grab?	not recorded	Standard Tungsten Mine, same trench as DR304 (see fig. 32). Sample from USBM 1980 RARE II study (no. 110 in Kreidler, 1981); pulp re-assayed in 1992. Trench was estimated as 60-ft-long in 1980. Sample of clayey limestone with abundant hematite and limonitic material (which may have been covered by slough by the time sample DR304 was collected in 1989).
DR306	Grid	n/a	Standard Tungsten Mine, westernmost shaft, 6-ft by 8-ft and 30-ft-deep (see fig. 32), in sedimentary rocks (bedding N. 65° W., SW. 48°). Dump of silicified limestone, sandstone, siltstone; contains about 200 st.
DR307	Grab	n/a	Standard Tungsten Mine, shaft in central part of property (see fig. 32). Sample from 1980 USBM RARE II study (no. 71 in Kreidler, 1981); pulp re-assayed in 1992. Shaft, 10-ft by 7-ft and 23-ft-deep intersects fault (strikes due N., dips E. 77°) with abundant malachite, minor hematite and pyrite; cuts through marble, limestone, quartzite.
DR308	Select	n/a	Standard Tungsten Mine, shaft in central part of property (see fig. 32). High-grade sample from same dump as DR307. Dump size unknown.

Number	Type	Length	Description
DR309	Grid	n/a	Standard Tungsten Mine, shaft in central part of property, south of DR307-308 shaft (see fig. 32). Same sample locality as DR310. Sample: contact of limestone with copper oxides, and quartzite. Dump about 200 st. Shaft: 8-ft by 8-ft and 50-ft-deep. Contact (fault?) N. 5° E., SE. 50°. Shaft inclined on contact.
DR310	Grab	n/a	Standard Tungsten Mine, shaft in central part of property, south of DR307-308 shaft (see fig. 32). Same sample locality as DR309. Sample from USBM 1980 RARE II study (no. 72 in Kreidler, 1981); pulp re-assayed in 1992. This shaft intersects same fault zone as DR307-308.
DR311	Grid	n/a	Standard Tungsten Mine, shaft in SW. part of property (see fig. 32), 6-ft by 6-ft and about 50-ft-deep. Sample of silicified arkose with epidote or garnet from 50 st dump. Same site as DR312.
DR312	Grab	n/a	Standard Tungsten Mine, shaft in SW. part of property (see fig. 32), same sample locality as DR311; shaft measured as 44-ft-deep. Dump lithologies identified as limestone, quartzite, and a dike. Noted mineralogy suggests silication of limestone.
DR313	Chip	3 ft	Standard Tungsten Mine, adit in SW. part of property (see fig. 32), driven E. for 15 ft through deeply weathered limestone, and intersecting igneous? dike trending about N. 65° E. Same slte as DR314. Sample from 1980 USBM RARE II study (no. 76 in Kreidler, 1981); pulp re-assayed in 1992. Sample: dike? material, stained with limonitic material, hematite; clayey.
DR314	Grid	n/a	Standard Tungsten Mine, sample from dump of DR313 adit (see fig. 32); adit measured at 25-ft-long, intersecting a N. 65° W., vertical fault. Sample: "high-grade"; mineralogy not known from Nov. 1989 data.
DR315	Select	n/a	Standard Tungsten Mine, shallow pit in SW. part of property (see fig. 32); no visible structure; limestone with hematite and limonitic material, chalcopyrite. Sample from 1980 USBM RARE II study (no. 78 in Kreidler, 1981); pulp re-assayed in 1992.

Number	Type	Length	Description
DR316	Chip?	not recorded	Festerling Mine (see fig. 32). From road cut through property: limestone breccia, silica-poor part that is common in this road cut. A test for background metals content. Sampled during a Nov. 1989 visit to property.
DR317	Chip?	not recorded	Festerling Mine (see fig. 32). From road cut through property: limestone breccia with quartzite clasts and matrix, calcite veining (not in place where sample was collected during Nov. 1989 visit to property). A test for background metals content in this rock unit, which occurs in place on the ridge NE. of the road.
DR318	Chip	15 ft	Festerling Mine (see fig. 32). Porphyry exposed in road cut through property; olive-colored (intermediate composition or weathered/altered); cuts limestone breccia. Igneous intrusion into Black Diamond fault zone? Sampled full thickness.
DR319	Select	n/a	Festerling Mine (see fig. 32). Porphyry dike, N. 80° E., NW. 70° exposed by shaft, 25-ft-deep; selected from dump (which is mostly removed for road fill) as in-place rock not accessible. Sample: 90+% silica, 10% calc-silicates, minor epidote. Dike can't be traced on strike (alluvium); dike 8-ft-thick in shaft wall.
DR320	Select	n/a	Festerling Mine (see fig. 32). Porphyry dike from dump of "glory-hole" type shaft on the property (same dump as DR321); a silica-rich porphyry (80% to 90% silica) with mafic phenocrysts (augite?), moderate amounts of dense calc-silicates with limonite. Casual identification could lead to "dark-green quartzite" as lithology.
DR321	Grid	n/a	Festerling Mine (see fig. 32). Rock from same dump as DR320 was incorrectly identified during Nov. 1989 visit as "silicified limestone". A dump grid would have collected nearly all chloritized granite from the "glory-hole" type shaft, with minor amounts of porphyry (DR320), which probably intersects granite somewhere down this shaft. Size of shaft collar probably from rapid decomposition of the chloritized granite at the collar and subsequent sloughing.

Number	Type	Length	Description
DR322	Chip	8 ft	Festerling Mine (see fig. 32). Fracture of Black Diamond fault zone, N. 25° W., NE. 50° through limestone breccia (sampled full thickness); exposed for 25 ft to S., then covered for 30 ft by talus. Next outcrop is granite. This fracture was excavated by inclined shaft at DR323. Sample: limestone breccia with calcite matrix; mild silication at 2 ft of width on the footwall (at granite contact).
DR323	Grid?	not re-corded	Festerling Mine (see fig. 32). Inclined shaft on S. 75° E. trend, sunk on same structure as DR322. Sample from dump. See DR322 for lithology. Sample a good test for any enrichment on DR322 structure at depth from this shaft.
DR324	Chip	3 ft	Festerling Mine (see fig. 32). Black Diamond fault zone, N. 30° W., NE. 63° to 75°, as much as 6-ft-wide, through limestone breccia; exposed for 85 ft along strike; may be continuous to DR322-323, but is weak there. Sample: fracture through breccia marked by red, calcite-rich zones, clayey gouge zones, or weak calc-silicate mineral development. *No evidence that this fracture zone cuts the granite on the property.*
DR325	Chip	3 ft	Festerling Mine (see fig 32). Fractured limestone breccia in Black Diamond fault zone, N. 35° W., NE. 65°, chloritic, gougey, heavy limonitic stain in zone (full width sampled); at granite contact with a limestone breccia block that has been enveloped by granite.
DR326	Grid	n/a	Festerling Mine (see fig. 32). Shaft with lagging, 6-ft by 6-ft and at least 30-ft-deep, on same structure as DR325. Sample of granite from dump is a good test for background metals content of this intrusive. Dump about 200 st.
DR327	Chip	2 ft	Prospect adit (fig. 32; see mine map, fig. 40) in northern extent of fracture zone that extends from Silver Cloud patent. Adit is barren limestone and marble. Sampled thin mafic dike with boudons of calc-silicates, moderate limonitic stain, and pyrite (<2%). This may be faulted DR328 skarn. Dump, barren, about 100 st. Nearby is a 20-ft-deep shaft exposing 1-ft to 2-ft-wide skarn (not sampled) as in DR328.

Number	Type	Length	Description
DR328	Chip	8 ft	Prospect adit and pit (fig. 32; see mine map, fig. 40) on limestone cobble-breccia at least 15-ft-wide, N. 20° W., SW. 60°, mostly covered where sampled. Sample: silicified breccia with green calc-silicates, epidote, minor pyrite, moderate secondary calcite, minor limonitic stain. Can't be traced on strike directly (cover), but calc-silicates in talus for 100 ft uphill and 200 ft downhill suggest continuity. Sample at DR327 and adjoining shaft suggest silicated structure may be faulted out within this overall continuous fault zone.
DR329	Grid	n/a	Prospect adit (fig. 32; DR329-330, fig. 38). Brecciated limestone from upper dump; contains traces of unidentified copper mineral; fracture zone is N. 50° E., NW. 85°. Fracture zone was not sampled in place by field geologist. Extent of fracture zone was not recorded. Dump about 10 st.
DR330	Grid	n/a	Prospect adit (fig. 32; DR329-330, fig. 38). Brecciated limestone, fractured limestone from lower dump (see DR329); no copper noted. Dump about 50 st.
DR331	Select	n/a	Prospect shaft (fig. 32, 38), inclined on N. 30° W. trend for 30 ft. Sunk on limestone breccia; sample from 200 st dump. Sample is "high-grade" from dump. Mineralogy not known, presumed to be copper-bearing. Extent of breccia not known. Trend of breccia equivalent to Escapule fault zone, in which this working lies.
DR332	Grid	n/a	Prospect shaft (fig. 32, 38), 6-ft by 6-ft collar and 200-ft-deep, in Escapule fault zone; fractures exposed in shaft collar: N. 30° W., SW. 85°, not sampled. Sample of silicified limestone on SE. lobe of dump (about 600 st). Another lobe of dump, immediately to NW. is about 400 st, and was not sampled. Extent of fracture zone not known.
DR333	Select	n/a	Prospect shaft DR333-334 (fig. 32, 38), 6-ft by 6-ft collar and 200-ft-deep, in Escapule fault zone; fractures exposed in collar: N. 55° W., NE. 85°, not sampled. Sampled of silicified limestone(?) with malachite and azurite selected from segregated part of dump (about 15 st). Extent of fracture zone not known.

Number	Type	Length	Description
DR334	Grid	n/a	Prospect shaft DR333-334 (fig. 32, 38); sample from main part of dump, limestone, locally silicified, local quartz veins and epidote. Dump about 200 st. See DR333. Note: 23 ft due S. is another inclined shaft, 10-ft-deep, inclined to SW., not sampled.
DR335	Grid	n/a	Prospect shaft DR335-336 (fig. 32, 38), 6-ft by 6-ft and 50-ft-deep with a NE.-trending drift off the shaft wall at -10 ft. Exposes 4-ft-thick fault, vertical, and probable NE. strike. Pinches out at shaft and is covered to the S. Heavily-silicified limestone, abundant red- and yellow-iron-oxide stains and thin (1-mm to 5-mm across) calcite veinlets; cannot be reached in place for sampling. Sample: marble from SE. lobe of dump (about 500 st).
DR336	Grid	n/a	Prospect shaft DR335-336 (fig. 32, 38), sample from NW. lobe of dump (about 200 st) ; silicified limestone with iron-oxide staining.
DR337	Chip	2.5 ft	Small open cut (fig. 32, 38) on fault zone (N. 50° E., SE. 75°) through limestone; silicified and hematite enriched, sampled full width. Cannot trace to NE. (cover); continues to SW. only 15 ft, to DR338.
DR338	Select	n/a	Shaft (fig. 32, 38), 30-ft-deep on fault zone, 4.5-ft-wide; same fault as DR337, cannot be reached in place due to undercut shaft collar. High-grade from dump. Structure covered to south. Dump about 50 st.
DR339	Chip	2.5 ft	Small open cut (fig. 32, 38) on fault zone (N. 30° E., vertical) through limestone; sampled full width: brecciated, heavily silicified limestone, abundant hematite and limonitic stain.
DR340	Select	n/a	High-grade from dump of DR339 (fig. 32, 38); fault zone material (see DR339): silicified limestone and vuggy quartz from fault; manganese oxide wad, dense iron-oxides, siderite.
DR341	Chip	2 ft	Outcrop of white vein(?) quartz and silicified limestone, N. 84° W., NE. 80°. Cuts contact of limestone and silicified limestone. No data on vein extent. Fig. 32, 38.
DR342	Grab	n/a	Talus (fig 32). Limonitic material, siceous. No structural data.

Number	Type	Length	Description
DR343	Chip	1 ft	Prospect adit DR343-344 (fig. 32; see map, fig. 40). Full width of gouge zone (yellow clay).
DR344	Grid	n/a	Prospect adit DR343-344 (fig. 32; see map, fig. 40). Dump material. No lithologic/mineralogic data. Examined in Nov. 1989.
DR345	Chip	7 ft	Prospect (fig. 32; see map DR345-347, fig. 40), upper working; skarn at contact of limestone and porphyry dike; green-brown calc-silicates, minor epidote and garnet, no visible sulfides. Can't trace on strike due to talus.
DR346	Chip	9 ft	Prospect (fig. 32; see map DR345-347, fig. 40), upper working; porphyry dike adjoining skarn, averages 10-ft- to 12-ft-thick; dark-green feldspar (chloritized?), minor epidote and limonitic stain, minor weathered pyrite.
DR347	Chip	1 ft	Prospect (fig. 32; see map DR345-347, fig. 40), lower adit; contact zone between porphyry dike and skarn; gougey and limonitic stain. See DR346.
DR348	Select	n/a	Three prospect shafts (fig. 32) along N. 60° E., vertical fracture in limestone breccia. Structure pinches out 20 ft S. of the southernmost shaft. Southernmost shaft is 8-ft-deep, heavily overgrown. Central shaft is only 15 ft to NE., 10-ft-deep and fault is 4-ft-wide there. Northernmost shaft is 10 ft N. of central shaft, 15-ft-deep. Heavy brush prevents sampling in place. Collected a representative sample of the fault zone material from dump, *not a high-grade* (there is no high-grade on the site): limestone breccia, vuggy, box-work structures, minor malachite, heavy limonitic and hematite stain, minor specular hematite. Covered immediately NE. of northernmost fault, but iron-stained outcrop uphill suggests possible 1,000 ft extension to NE. from the shafts. Not visited due to lack of time.
DR349	Chip	8 ft	Rock in Santa Fe Pacific Mining 1987 exploration drill road cut of dark gray decalcified(?) limestone and light gray silicified limestone. No data on structural trends. Fig. 32.
DR350	Chip	4 ft	Prospect adit (fig. 32; see map DR350-352, fig. 39) intersects fault (N. 80° W., NE. 24°); full width of prospected zone; dark green calc-silicates, rich in carbonate, minor rusty limonitic particles, no pyrite seen.

Number	Type	Length	Description
DR351	Chip	1.5 ft	Prospect adit DR350-352 (fig. 32; see map, fig. 39); sampled full width of stoped zone: 95% recrystallized, gray limestone; 1-in.- to 2-in.-thick zone of vuggy, granular, white quartz with minor amounts of limonitically stained clay.
DR352	Chip	3 ft	Prospect adit DR350-352 (fig. 32; see map, fig. 39); limestone breccia-filled fault, sampled full width of mined zone. Stoping took place where vuggy, limonitically stained quartz is present in this zone. No malachite or sulfides seen. Zone is not enriched where sampled and is mostly limestone.
DR353	Select	n/a	Prospect shaft (fig. 32; no map), 6-ft by 10-ft and 30+-ft-deep, inclined 45° on N. 60° E. trend. Exposes fine-grained, gray limestone; no structure apparent at collar or nearby outcrop. Sample from dump (about 20 to 30 st) selected skarn, vuggy, with abundant calcite groundmass crystals and vug-fillings.
DR354	Chip?	not recorded	Phelps-Dodge 1979 exploration roadcut exposes silicified limestone breccia adjacent to dike of unspecified lithology. Both cut limestone. No data on structural trends, dimensions. Fig. 32.
DR355	Chip	2 ft	Moonlight Mine (fig. 32; see mine map, fig. 37), main adit, skarn zone (N. 12° W., SW. 30°) with silicated limestone, sphalerite, 10% calc-silicates, 1% pyrite. Part of adit driven since 1955 on one of more favorable grade sulfide zones, although it is thin.
DR356	Chip	1.5 ft	Moonlight Mine (fig. 32; see mine map, fig. 37), main adit, skarn zone (N. 20° W., SW. 45°) with silicated marble, actinolite, 3% chalcopyrite, 3% malachite, 5% pyrite. Immediately to SW., this zone was explored for 30 ft down dip by winze (no sample possible there).
DR357	Chip	2 ft	Moonlight Mine (fig. 32; see mine map, fig. 37), main adit, same zone as DR356, 3% chalcopyrite, 6% pyrite.
DR358	Chip	2 ft	Moonlight Mine (fig. 32; see mine map, fig. 37), main adit, bedding plane fracture zone, N. 31° W., SW. 60°, through silicified, silicated limestone (sampled full width), tremolite, 4% black sphalerite and chalcopyrite, 5% pyrite, minor amounts of quartz crystals, 5 mm across.

Number	Type	Length	Description
DR359	Chip	4 ft	Moonlight Mine (fig. 32; see mine map, fig. 37), main adit, skarn in bedding plane of quartzite (N. 36° W., SW. 25°) at portal; epidote, green garnet.
DR360	Chip	1.5 ft	Moonlight Mine (fig. 32; see map, fig. 37), small open cut/adit intersecting skarn (N. 20° W., SW. 20°) through quartzite; abundant siderite, weak limonitic stain, minor pyrite. Very near limestone contact.
DR361	Chip	3 ft	Moonlight Mine (fig. 32; see map, fig. 37), upper working, small inclined shaft collared in limestone and intersecting skarn (same zone as DR360); sample from a minor subfracture through this skarn (N. 55° E., NW. 85°), but is still representative of the mined skarn. 60 st mined from this working and stockpiled at collar as of 1955 has been removed.
DR362	Grid	n/a	Moonlight Mine (fig. 32; see map, fig. 37), upper working, skarn from dump, pyrite, magnetite, epidote, amphibole. Dump about 400 st.
DR363	Chip	3 ft	Moonlight Mine (fig. 32; see map, fig. 37), upper working, skarn (N. 50° W., SW. 85°) at collar; the entire inclined shaft SW. of this point is in this same skarn.
DR364	Chip	not re-corded	Escapule fault zone (same zone on which Moonlight Mine skarn occurs), sampled in Phelps Dodge 1979 exploration drill road cut. Sample lithology unknown. Fig. 32.
DR365	Chip	2 ft	Shaft (20-ft-deep) in quartzite on Black Diamond fault zone; intersects 2-ft-wide fault, N. 45° W., SW. 55° (full width sampled) with minor copper oxide staining. Dump about 20 st. Fig. 32.
DR366	Chip	4 ft	Prospect shaft (DR366-368). Quartzite (N. 50° W., SW. 62°) bedrock that could be reached at collar. Fig. 32.
DR367	Grid	n/a	Prospect shaft (DR366-368, fig. 32). Shale, sheared(?), on lithologically separated dump (about 3,000 st). Rock exposed in shaft, can't be reached from surface. Shaft: 8-ft by 8-ft, inclined S. 40° W. @ 62° for 30 ft. Chrysocolla-rich rock on dump not seen in shaft, may be foreign introduction to dump, and was not sampled.
DR368	Select	n/a	Prospect shaft (DR366-368, fig. 32). "Light-colored rock" from lithologically separated dump (see DR367).

Number	Type	Length	Description
DR369	Chip	12 ft	Rhyolite(?) porphyry dike, light gray, N. 20° W., dip indeterminate, possibly near vertical; quartz and feldspar phenocrysts 1 mm across; groundmass aphanitic; cut by quartz veinlets, 1- to 3 mm thick, some with hematite; slight epidotization along fractures. Contains more phenocrysts, iron, and quartz veinlets than does porphyry dikes exposed in Black Diamond Mine, but is likely the same dike or dike system. Full thickness is 12- to 15-ft. Contacts: NE. covered; SW. is quartzite. Crops out by exploration drill road (reclaimed as of Jan. 1992); middle D.H. of a nine-hole grid (air holes) done by Manhattan Minerals Corp., 1992. Fig. 32, 33.
DR370	Chip	66 ft	Black Diamond fault zone, contacts hematitic-red, limey sandstone at N. 30° W., NE. 77° orientation on SW. side of fault; exposed in exploration drill road cut of Manhattan Minerals Corp. (since reclaimed). Lost uphill and downhill (along strike) due to talus; NE. side of fault lost in talus so sample is *exposed* width only. Lithology: quartzite, fissile, some shearing and slickensides, minor limonitic stain in parts, 2% by volume is a green quartzite caught up in fault zone. A check of fault zone for precious metals content. Fig. 32, 33.
DR371	Chip	72 ft	Black Diamond fault zone, trends approximately N. 65° W. Covered on NE. side but cannot be more than 92-ft-thick; SW. contact is limey sandstone as in DR370. Lithology: quartzite, green, fissile, contains epidote veinlets, 0.5 mm thick. Within 20 ft of porphyry dike (probably same dike as DR369). Exposed in exploration drill roadcut (since reclaimed). Fig. 32, 33.
DR372	Chip	5 ft	Prospect adit above Black Diamond Mine, driven on Black Diamond fault zone (fig. 32-33; see mine map DR372-382, fig. 36). Fault: N. 25° to 35° W., SW. 63° to 79°, little exposure left in adit; 2-ft- to 5-ft-thick on trend (about 130 ft total on strike); pinches out to NW., probably faulted off to SE. Lithology: light gray, competent limestone with minor limonitic stain and malachite on fractures. Occurs about 30 ft above the top of the Black Diamond Mine skarn.

Number	Type	Length	Description
DR373	Chip	2.5 ft	Fracture that approximately parallels DR372 (fig. 32-33; see mine map DR372-382, fig. 36), N. 49° W., SW. 65°, through limestone; zone has quartz veinlets and unidentified iron oxide stain (minor). About 70 ft along strike; apparently pinches out to NW. and faulted off to SE. Within 10 ft of top of Black Diamond Mine skarn.
DR374	Chip	3.5 ft(?)	Shear through top of Black Diamond Mine skarn which was excavated by No. 2 Crosscut (fig. 32-33; see mine map DR372-382, fig. 36), approximately E.-W. strike (based on 1901 survey; too much magnetite in outcrop for accurate measurement) and dips SE. about 75°. Shear thickens considerably in No. 2 Crosscut's underhand stope (see map). Lithology: magnetite-rich skarn, heavy limonitic stain, secondary quartz crystal growths.
DR375	Grid	n/a	Black Diamond Mine, No. 2 Crosscut dump: 95% slightly silicated limestone, 3% skarn with minor malachite, 2% porphyry dike. Dump is about 400 st. Fig. 32-33, 36.
DR376	Chip	8 ft	Black Diamond Mine, No. 3 Crosscut (fig. 32-33; see mine map DR372-382, fig. 36) fault zone, N. 12° W., SW. 45° (sampled full thickness); limestone, recrystallized, with minor magnetite, chalcopyrite, bornite; has secondary enrichment of iron and copper on hangingwall by winze. This fault cuts off shear zone DR377. Was stoped up 12 ft.
DR377	Chip	3.5 ft	Black Diamond Mine, No. 3 Crosscut (fig. 32-33; see mine map DR372-382, fig. 36) shear (sampled full thickness); shearing is not intense. Sample: competent, slightly silicated limestone, medium gray, with 1-in.-thick zone of secondary enrichment of iron and copper minerals, no sulfides seen. Structure cut off by fault zone DR376 and pinches out to SE.
DR378	Grab	n/a	Black Diamond Mine, No. 3 Crosscut (fig. 32-33; see mine map DR372-382, fig. 36), skarn collected where bottom of No. 2 Crosscut underhand stope has caved through into No. 3 Crosscut. This was only way to sample No. 2 Crosscut's stoped skarn. Sample: magnetite-enriched skarn, minor chalcopyrite, minor vugs with limonitic stain.

Number	Type	Length	Description
DR379	Grid	n/a	Black Diamond Mine, No. 3 Crosscut dump (fig. 32-33; see mine map DR372-382, fig. 36); 2/3 of sample is unaltered, competent limestone; 1/6 is skarn, highly silicified, with minor malachite, <5% sulfides (pyrite, bornite, chalcopyrite); 1/6 is rhyolite porphyry dike. Dump is about 2,000 st.
DR380	Chip	30 ft	Black Diamond Mine (fig. 32-33; see mine map DR372-382, fig. 36). Prospect adit driven into outcrop of the magnetite-rich skarn at elevation between the No. 3 Crosscut and the Dividend level, a few feet higher than collar of Queen shaft. Sample is effectively 30-ft-deep horizontal "core" into the skarn. Lithology: skarn, silicified, magnetite rich; disseminated chalcopyrite, pyrite, minor hematite. Adit has acted as a "well" to groundwater, resulting in secondary calcite, iron and copper minerals on ribs.
DR381	Chip	15 ft	Black Diamond Mine area (fig. 32-33; see mine map DR372-382, fig. 36). Magnetite-rich skarn at elevation of Queen shaft. Skarn, fractured and silicified, with malachite, chalcanthite, earthy hematite. Exposed by exploration roadcut.
DR382	Chip	20 ft	Black Diamond Mine area (fig. 32-33; see mine map DR372-382, fig. 36). Magnetite-rich skarn at elevation of Queen shaft. Skarn, fractured, with abundant specular hematite, moderate malachite. By portal of prospect adit driven into the skarn. Adit nearly filled in by exploration road grade; at least 10-ft-long.
DR383	Grid	n/a	Prospect pit or caved adit(?) excavated into skarn, silicified, epidote- and magnetite-enriched, possibly brecciated. Most-southern sample of skarn at elevation of Dividend level. Fig. 32-33.
DR384	Chip	4.2 ft	Black Diamond Mine, Dividend level (fig. 32-33; see mine map DR384-404, fig. 35), sampled full thickness. Sheared, silicated limestone, late feldspar veinlets, no visible sulfides. Structure stoped where limonitic stain and secondary copper evident; these possibly enriched zones could not be reached for sampling. Porphyry dike cuts this off to SE.; NW. end not seen due to impassible, open winze.

Number	Type	Length	Description
DR385	Select	n/a	Black Diamond Mine, Dividend level (fig. 32-33; see mine map DR384-404, fig. 35). Evidently "ore" zone from Bulkhead stope. Sampled rock is stope slough, possibly from top of stope. In-place zone cannot be reached. Sample: mostly sulfides (chalcopyrite, bornite). Sample serves as characterization of ore tenor in one of the largest stopes in the mine.
DR386	Select	n/a	Black Diamond Mine, Dividend level (fig. 32-33; see mine map DR384-404, fig. 35). Evidently "ore" zone from "Big" stope. Sampled rock is stope slough, possibly from top of stope. In-place zone cannot be reached. Sample: skarn, 15% magnetite, enriched in secondary copper and earthy limonitic material. Not as metal-rich as DR385. Sample serves as characterization of ore tenor in this stope, which may be mined out.
DR387	Chip	2 ft	Black Diamond Mine, Dividend level (fig. 32-33; see mine map DR384-404, fig. 35). Rhyolite porphyry dike, one of two that intersect all mine levels, collected at limestone contact. White, aphanitic groundmass with quartz phenocrysts, 1- to 2-mm across, minor, disseminated pyrite (<1%). A check for metallization where dike intrudes the carbonates.
DR388	Chip	4 ft	Black Diamond Mine, Dividend level (fig. 32-33; see mine map DR384-404, fig. 35). Limestone, light gray, recrystallized, calcite veinlets 3- to 10 mm thick are common, but this is *not* a stockwork or breccia. Taken at contact with porphyry dike, and for 4 ft into limestone unit, perpendicular to dike contact. No visible sulfides.
DR389	Chip	8 ft	Black Diamond Mine, Dividend level (fig. 32-33; see mine map DR384-404, fig. 35). Shear through magnetite skarn, N. 25° W., SW. 66°, chalcopyrite, bornite(?), hematite, calcite, magnetite, secondary copper stain, minor amounts of quartz pods. Sampled full width.
DR390	Chip	6 ft	Black Diamond Mine, Dividend level (fig. 32-33; see mine map DR384-404, fig. 35). Shear through silicated, fractured limestone, massive specular hematite, also magnetite(?), chalcopyrite, hematite staining, calcite veinlets, secondary copper minerals. Pyrite disseminated in limestone. Sampled full width.

Number	Type	Length	Description
DR391	Chip	3.5 ft	Black Diamond Mine, Dividend level (fig. 32-33; see mine map DR384-404, fig. 35). Fault through magnetite-enriched skarn. Sampled full width. Sample: fractured, fissile limestone, secondary calcite (10%), no visible sulfides. This structure was drifted on in this part of Dividend level.
DR392	Chip	3.8 ft	Black Diamond Mine, Dividend level (fig. 32-33; see mine map DR384-404, fig. 35). Fault through magnetite-enriched skarn. Sampled full width. Sample: sheared, fissile, epidotized limestone, minor garnet and magnetite. This structure was drifted on in this part of Dividend level. Has rolled over from site DR392. Between DR391 and DR392 on this structure is area of secondary copper enrichment (atypical of structure and likely from groundwater movement, and was not sampled).
DR393	Chip	6 ft	Black Diamond Mine, Dividend level (fig. 32-33; see mine map DR384-404, fig. 35). Fault through magnetite-enriched skarn. Sampled from footwall to where hangingwall is lost in rib. This structure was drifted upon in this part of Dividend level, and stoped a short distance to the SW. Sample: silicated, fissile, limestone, enriched in magnetite, with black garnet and secondary calcite.
DR394	Chip	59 ft	Black Diamond Mine, Dividend level (fig. 32-33; see mine map DR384-404, fig. 35). Magnetite-enriched skarn sampled horizontally along rib. Sample is in effect a "core" of the skarn between the two fracture zones that were drifted upon (DR395 and DR391-393,396). Sample: silicated limestone, 20% to 30% magnetite, 20% actinolite, 5% garnet, traces of pyrite, chalcopyrite, secondary copper minerals.
DR395	Chip	8 ft	Black Diamond Mine, Dividend level (fig. 32-33; see mine map DR384-404, fig. 35). Sheared magnetite-enriched skarn. Sampled full width. This is the second fracture zone that was drifted upon in this part of the Dividend level (other is DR391-393,396). Margins of shear are indistinct, mineralogy, lithology same as sample DR394, except for addition of minor limonitic staining along shear planes. Orientation of shear highly variable, as is width. This shear zone intersects others 90 ft to the SE., and was stoped there.

Number	Type	Length	Description
DR396	Chip	5.5 ft	Black Diamond Mine, Dividend level (fig. 32-33; see mine map DR384-404, fig. 35). Shear in magnetite-enriched skarn. Sampled from footwall (hangingwall concealed in rib). This fracture zone that was drifted upon in this part of the Dividend level (DR391-393,396). Sample: magnetite-enriched (25% magnetite), silicated limestone, 10% garnet.
DR397	Chip	4.3 ft	Black Diamond Mine, Dividend level (fig. 32-33; see mine map DR384-404, fig. 35). Shear in skarn, N. 25° W., NE. 62° (sampled full width). This is a third fracture zone that was drifted upon in Dividend level (others: DR391-393,396; DR395); shear dies out or is lost in rib about 50 ft to the NW. of sample site in this drift. Sample: silicated limestone, anastomosing fractures, with chalcopyrite, calcite, hematite, minor limonitic stain.
DR398	Select	n/a	Black Diamond Mine, Dividend level (fig. 32-33; see mine map DR384-404, fig. 35). Stope situated above Dog stope, where three differently oriented fracture zones intersect. Sample of skarn (N. 45° W., NW. 55°) slough from stope walls, chalcopyrite, specular hematite, limonitic stain and secondary copper coatings, trace pyrite. Skarn within reach still on perimeter of stope, but location of some winzes uncertain; skarn appears mined out. Sample characterizes the largest accessible stope in the magnetite skarn (Dog stope, below about 75 ft, was probably larger).
DR399	Chip	1 ft	Black Diamond Mine, Dividend level (fig. 32-33; see mine map DR384-404, fig. 35). Skarn from N. 70° E., SE. 57° fracture zone which occurs in same stope as DR398, just a different structure. Sample: top 1 ft of hangingwall sampled outside stope area where mine back in good condition; magnetite-rich skarn, minor chalcopyrite, bornite; forms sharp contact with limestone. Little dissemination of sulfides in this limestone wallrock.

Number	Type	Length	Description
DR400	Chip	47.5 ft	Black Diamond Mine, Dividend level (fig. 32-33; see mine map DR384-404, fig. 35). Magnetite skarn that adjoins E. side of fracture zone mined along Queen shaft. Sample equates a "core" through this section of the skarn. Sample: heavily silicated limestone with 5% to 20% disseminated magnetite, and magnetite along joints and minor fracture planes; also actinolite, calc-silicates, minor pyrite, limonitic stain, and clay gouge. Includes 2 breccia zones, one E.-W., dipping S. 60°, and 6- 8-ft-thick, and one vertical, 2-in. to 7-in.-thick and cut off by the E.-W. breccia so that it's on the north side of drift only.
DR401	Chip	7 ft	Black Diamond Mine, Dividend level (fig. 32-33; see mine map DR384-404, fig. 35). Shear (N. 40° W., SW. 45°), sampled full width. Strike dubious due to concentrated magnetite and poor exposure on south rib. Heavily fractured limestone, silicated, gougey, limonitic stain, with 2% to 5% chalcopyrite, 2% to 5% calcite, 2% feldspar.
DR402	Chip	44.5 ft	Black Diamond Mine, Dividend level (fig. 32-33; see mine map DR384-404, fig. 35). Silicated limestone sample illustrates metal content in wide section of skarn which was *not* a mining target, as does DR400. Moderately silicated limestone, 2% to 5% secondary calcite, minor secondary quartz, 20% magnetite, 1% to 3% rusty pyrite.
DR403	Chip	44 ft	Black Diamond Mine, Dividend level (fig. 32-33; see mine map DR384-404, fig. 35). Sample serves same geologic purpose as DR400,402. Boundary chosen as this zone has more sulfides than DR401. Epidotized limestone, moderately sheared, chalcopyrite (2% to 5%), fresh and weathered pyrite (2% to 7%), minor garnet and secondary calcite, magnetite (5%), disseminated and on shear planes that parallel the porphyry dike contact.
DR404	Grid	n/a	Black Diamond Mine, Dividend level (fig. 32-33; see mine map DR384-404, fig. 35). From dump. Limestone, slightly silicated, mostly competent (50%); porphyry dike (35%); skarn with secondary copper stain and limonitic stain (15%). Dump about 20,000 st.

Number	Type	Length	Description
DR405	Chip	8 ft	Prospect adit, about N. 5° W., and 25-ft-long (fig. 32-33; no map) on Black Diamond Mine area. Chip above portal includes quartzite and heavily iron-oxide-stained intrusive oriented N. 65° W., SW. 63°.
DR406	Chip	5 ft	Black Diamond Mine, Bagge level, (fig. 32-33; see mine map DR406-435, fig. 34). Fault zone, full width 5.5 ft. Footwall is N. 46° W., SW. 66° and hangingwall is N. 55° W., SW 79°; flattening of footwall suggests this is same zone as stope 40 ft to north (see map). Sample: fractured limestone, rare calcite veinlets (<1 mm thick), trace pyrite (disseminated); on footwall, 1 ft of hematitic clay gouge.
DR407	Chip	5 ft	Black Diamond Mine, Bagge level, (fig. 32-33; see mine map DR406-435, fig. 34). Same fault as DR406, oriented N. 50° W., vertical. Sample from hangingwall (footwall concealed in rib): limestone, fractured and gougey, hematite-stained, secondary copper stain, resembling the 1 ft zone in DR406 footwall. Includes 3-4-in. shaley zone.
DR408	Chip	5 ft	Black Diamond Mine, Bagge level, (fig. 32-33; see mine map DR406-435, fig. 34). Same fault as DR406-407, oriented N. 50° W., SW. 74°. Sample, full width of zone, is heavily fractured limestone with calc-silicates throughout, minor hematite, calcite veinlets. Silicified zone, 1-ft-thick.
DR409	Chip	18 ft	Black Diamond Mine, Bagge level, (fig. 32-33; see mine map DR406-435, fig. 34). Limestone between footwall of DR406-408 fault and porphyry dike; minor calc-silicate alteration.
DR410	Chip	1.7 ft	Black Diamond Mine, Bagge level, (fig. 32-33; see mine map DR406-435, fig. 34). Fault, N. 40° W., SW. 85° (sampled full width), same zone as DR406-408. Gouge of limestone, hematite stain, no visible sulfides. Limestone on either side.
DR411	Chip	2.2 ft	Black Diamond Mine, Bagge level, (fig. 32-33; see mine map DR406-435, fig. 34). Fault, N. 40° to N. 50° W., SW. 75° to 82° (sampled full width), parallels DR406-408,410 fault. Fractured limestone, minor hematite and gouge.

Number	Type	Length	Description
DR412	Chip	24 ft	Black Diamond Mine, Bagge level, (fig. 32-33; see mine map DR406-435, fig. 34). Silicated limestone between DR411 fault and porphyry dike; magnetite-enriched.
DR413	Chip	7 ft	Black Diamond Mine, Bagge level, (fig. 32-33; see mine map DR406-435, fig. 34). Fault, N. 65° W., SW. 60° to 65° on hangingwall and N. 45° W., SW. 75° on footwall. Sampled full width: competent limestone with calcite stringers (1- 2-mm-thick), minor hematitic stain. Same zone as DR411, but has less internal shearing.
DR414	Chip	34 ft	Black Diamond Mine, Bagge level, (fig. 32-33; see mine map DR406-435, fig. 34). Porphyry dike, $CaCO_3$ in aphanitic groundmass; probably rhyolite; phenocrysts: quartz 1 mm- to 4-mm-wide. A check for metallization in this pervasive dike. Appears barren.
DR415	Chip	3.7 ft	Black Diamond Mine, Bagge level, (fig. 32-33; see mine map DR406-435, fig. 34). Fault, N. 49° W., NE. 72°, same zone as DR413,415, but has rolled over. *Dissipates into small fractures to the SE.* Limestone, heavily sheared, enriched in calcite growths, minor hematite, trace pyrite.
DR416	Chip	5 ft	Black Diamond Mine, Bagge level, (fig. 32-33; see mine map DR406-435, fig. 34). Fault zone, chloritized, composed of quartzite with small amounts of limestone caught up in fault zone. A test of small structure crosscutting skarn.
DR417	Chip	6 ft	Black Diamond Mine, Bagge level, (fig. 32-33; see mine map DR406-435, fig. 34). Fault of weakly silicified limestone with 10% magnetite and 5% specular hematite, 2% calcite (bladed), and 2% quartz. A test of small structure crosscutting skarn.
DR418	Chip	2.2 ft	Black Diamond Mine, Bagge level, (fig. 32-33; see mine map DR406-435, fig. 34). Fault of quartzite(?), with 15% magnetite, 1% pyrite(?), minor unidentified iron-oxide stain. A test of small structure crosscutting skarn.
DR419	Chip	8 ft	Black Diamond Mine, Bagge level, (fig. 32-33; see mine map DR406-435, fig. 34). Fault that was drifted upon, this level (sampled full width). Limestone, minor epidotization, heavy magnetite along 1/4-in.-width fractures; includes thin calcite vein. Near raise into Dog stope and Dividend level.

Number	Type	Length	Description
DR420	Select	n/a	Black Diamond Mine, Bagge level, (fig. 32-33; see mine map DR406-435, fig. 34). Skarn from ore chute, possibly characterization of rock mined from Dog stope. Major calcite, magnetite, specular hematite, minor epidote.
DR421	Chip	4 ft	Black Diamond Mine, Bagge level, (fig. 32-33; see mine map DR406-435, fig. 34). Fault that was drifted upon, same zone as DR419 and probably DR420 (sampled full width). Cut off porphyry dike to SW. Sample: limestone with 20% to 30% secondary calcite stringers, minor magnetite, hematite; gouge on footwall, 3-in.- to 6-in.-thick.
DR422	Grab	n/a	Black Diamond Mine, Bagge level, (fig. 32-33; see mine map DR406-435, fig. 34). Porphyry dike. A check for metallization in this pervasive dike; same structure as DR414.
DR423	Chip	78 ft	Black Diamond Mine, Bagge level, (fig. 32-33; see mine map DR406-435, fig. 34). Skarn, mostly limestone with common fractures (N. 10° to 15° E., NW. 80°), some of which have concentrations of magnetite, bornite(?), chalcopyrite. Numerous 3-ft- to 5-ft-thick magnetite zones. Sample in essence is a "core" through the magnetite skarn. A check for metallization in this un-mined skarn.
DR424	Chip	4 ft	Black Diamond Mine, Bagge level, (fig. 32-33; see mine map DR406-435, fig. 34). Silicified fracture, 15% pyrite (grains up to 2 mm across). A test of small structure crosscutting skarn.
DR425	Chip	2 ft	Black Diamond Mine, Bagge level, (fig. 32-33; see mine map DR406-435, fig. 34). Silicified fracture, gouge, 15% pyrite (grains up to 2 mm across), 10% specular hematite. A test of small structure crosscutting skarn.
DR426	Chip	5.5 ft	Black Diamond Mine, Bagge level, (fig. 32-33; see mine map DR406-435, fig. 34). Silicified skarn, 10% specular hematite, <1% magnetite. A test of small structure crosscutting skarn.

Number	Type	Length	Description
DR427	Chip	4 ft	Black Diamond Mine, Bagge level, (fig. 32-33; see mine map DR406-435, fig. 34). Fault through magnetite skarn, parallels stoped zone to SW. in the mine, but was not drifted on extensively at DR427; sampled full thickness. Sample: limestone, heavily fractured, with calcite crystals, veinlets, minor disseminated pyrite; heavy stain of iron-oxides on hangingwall and for 2 ft into wallrock; copper sulfate stain on zone at face.
DR428	Chip	38 ft	Black Diamond Mine, Bagge level, (fig. 32-33; see mine map DR406-435, fig. 34). Epidotized limestone skarn, 10% to 20% magnetite, minor pyrite, chalcopyrite, hematite; abundant calcite crystals, veinlets. Sample in essence is a "core" through the un-mined skarn.
DR429	Chip	10 ft	Black Diamond Mine, Bagge level, (fig. 32-33; see mine map DR406-435, fig. 34). Quartzite with unidentified iron-oxide stain, 3% pyrite, <1% malachite. A test for disseminated metallization.
DR430	Chip	10 ft	Black Diamond Mine, Bagge level, (fig. 32-33; see mine map DR406-435, fig. 34). Quartzite with strong, unidentified iron-oxide stain, 4% pyrite (grains <1 mm across). A test for disseminated metallization.
DR431	Chip	6 ft	Black Diamond Mine, Bagge level, (fig. 32-33; see mine map DR406-435, fig. 34). Silicified fracture in limestone, possibly same as DR427 or a splay, 2% pyrite (grains <1 mm across), strong staining of manganese and unidentified iron-oxide (orange).
DR432	Chip	2.7 ft	Black Diamond Mine, Bagge level, (fig. 32-33; see mine map DR406-435, fig. 34). Fracture in limestone, slightly silicified, possibly same as DR427 or a splay, 2% pyrite (grains <1 mm across), strong staining of manganese and unidentified iron-oxide (yellow-brown).
DR433	Chip	9 ft	Black Diamond Mine, Bagge level, (fig. 32-33; see mine map DR406-435, fig. 34). Porphyry dike, felsic, 5% pyrite on fractures, 1% magnetite, very strong jarosite and goethite. Chalcanthite, right rib, by sill.

Number	Type	Length	Description
DR434	Grid(?)	n/a	Black Diamond Mine, Bagge level, (fig. 32-33; see mine map DR406-435, fig. 34). Dump sample (assumed representative): 90% skarn, epidotized; also porphyry dike and a purple quartz porphyry not observed in adit; some skarn pieces enriched in magnetite, chalcopyrite, and copper-sulfide weathering products. Dump size about 1,000 st.
DR435	Select	n/a	Black Diamond Mine, Bagge level, (fig. 32-33; see mine map DR406-435, fig. 34). A sample from apparent stockpile, immediately north of DR434; skarn with major calcite and magnetite, also quartz, hematite, minor chalcopyrite. Size about 10 st.
DR436	Select	n/a	Former Black Diamond smelter site; slag poured from matte smelting of self-fluxing, silica-and-iron-rich, sulfide ores of copper, with silver byproduct, between 1902 and 1907. From SW. part of slag pile (about 24,000 ft^3). Pl. 1.
DR437	Select	n/a	Black Diamond smelter slag; from NW. part of slag pile (about 4,800 ft^3). See DR436. Pl. 1.
DR438	Select	n/a	Unprocessed Black Diamond Mine ore from Black Diamond smelter site. Pl. 1
DR439	Select	n/a	Black Diamond smelter slag; from E. part of slag pile (about 90,000 ft^3). See DR436. Pl. 1.
DR440	Select	n/a	Black Diamond smelter slag; from S. part of slag pile (about 20,000 ft^3). See DR436. Pl. 1.
DR441	Chip	6 ft	Prospect adit (pl. 1, no map), 20-ft-long, exposes quartz porphyry dike (N. 47° W., SW. 70°) hosted in arkose. No visible mineralization.
DR442	Chip	30 ft	Quartz vein in outcrop; data on structural orientation, extent, mineralogy not available from Nov. 1989 examination. Outcrop about 65 ft NE. of DR443 shaft. Pl. 1.
DR443	Select	n/a	Prospect shaft, 5-ft by 5-ft and 30-ft-deep, inclined at high angle to SE.; excavated on quartz and calcite veins that cut limestone and brecciated arkose?. Sample is "high-grade". Data on structural orientation, extent, mineralogy, dump size not available from Nov. 1989 examination. Pl. 1.

Number	Type	Length	Description
DR444	Grid	n/a	Prospect shaft, 6-ft by 6-ft and 30-ft-deep, lagging at top, with ladder (not entered). Sample is limestone with iron-oxide staining and possible manganese-oxide staining. Representative dump sample. Data on structural orientation, extent, mineralogy, dump size not available from Nov. 1989 examination. Pl. 1.
DR445	Grid	n/a	Prospect shaft, 5-ft by 5-ft and 10-ft-deep; about 160 ft on S. 50° E. trend from DR444 shaft. Sample is limestone with quartz veinlets. Representative dump sample. Data on structural orientation, extent not available from Nov. 1989 examination. Dump about 10 st. About 80 ft to the north is another shaft, 4-ft- by 6-ft and 15-ft-deep, in dolomite (no sample collected) with N 5° E., NW. 40° bedding. Pl. 1.
DR446	Grid	n/a	Prospect shaft, 5-ft by 6-ft and 15-ft-deep, inclined S. 30° W. at undetermined angle. Sample is dolomite with quartz veinlets, representative of dump. Site visited Nov. 1989. No data on structural orientation, extent. Dump about 10 st. Shaft is 120 ft E. of DR445. Pl. 1.
DR447	Select	n/a	Prospect adit, about 45-ft-long, trends N. 10° W. for 15 ft on a fault (N. 10° W., SW. 65°), then trends N. 55° W. for about 30 ft along bedding. No data extent of fault. Bedding dips NE.35°. Sample is "high-grade" from dump; no data on mineralogy, lithology; likely is material from fault zone noted above. Site visited Nov. 1989. See sample DR448. Adit is 380 ft due S. of DR444 shaft. Pl. 1.
DR448	Grid	n/a	From dump of prospect DR446, representative of all rock on dump. Nov. 1989 visit. No data on mineralogy, lithology; likely is carbonate. Dump about 400 st. Pl. 1.
DR449	Grid	n/a	Gordon Spring prospect (see fig. 50), shaft, 5-ft by 6-ft and 30-ft-deep; inclined S. 15° W., at about 50°. Intersects limestone and silicified limestone or quartzite (representative dump sample. Sedimentary bedding N. 75° W., SW. 55°.

Number	Type	Length	Description
DR450	un-known	not re-corded	Gordon Spring prospect (see fig. 50), shaft, 8-ft by 5-ft, inclined 65° on S. 35° W. trend, 25-ft-deep; intersects diopsidic (chloritic?) quartzite (silicified limestone?). Shaft sunk on bedding. Sample of limestone with moderate malachite and azurite. Sample collected during 1980 USBM RARE II study (sample 70 in Kreidler, 1981); pulp re-assayed in 1992.
DR451	Grid	n/a	Gordon Spring prospect (see fig. 50), shaft, 6-ft by 6-ft and 15-ft-deep, intersects limestone, quartzite with calcite cement, and diopsidic marble. Representative of 20 st dump. Unstable shaft collar.
DR452	un-known	not re-corded	Gordon Spring prospect (see fig. 50), same shaft, sample locality as DR451. Sample collected during 1980 USBM RARE II study (sample 69 in Kreidler, 1981); pulp re-assayed in 1992. Limestone from dump with malachite, azurite and abundant hematite stain. Possibly high-grade of DR451 rock. Field geologists identified a drift at the bottom of the shaft (direction not recorded).
DR453	Grid	n/a	Gordon Spring prospect (see fig. 50), shaft, 6-ft by 6-ft and at least 30-ft-deep. Dump has limestone and limey mudstone (bedding N. 80° E., SE. 60°). Dump about 40 st.
DR454	un-known	not re-corded	Gordon Spring prospect (see fig. 50), same shaft, sample locality as DR453. Sample collected during 1980 USBM RARE II study (sample 67 in Kreidler, 1981); pulp re-assayed in 1992. Limestone from dump with no apparent alteration or metallization.
DR455	Grab?	not re-corded	Gordon Spring prospect (see fig. 50), shallow pit (2-ft-deep). Sample collected during 1980 USBM RARE II study (sample 68 in Kreidler, 1981); pulp re-assayed in 1992. Limestone from dump with minor limonitic stain.
DR456	un-known	not re-corded	Gordon Spring prospect (see fig. 50), shaft, 6-ft by 6-ft and 6-ft-deep, driven on horizontal diopsidic marble (sericite? alteration); one grain of pyrite. Sample from dump.
DR457	Grid	n/a	Gordon Spring prospect (see fig. 50), shaft, 6-ft by 5-ft, inclined for 20 ft at 35° on S. 5° W. trend. Approximately follows bedding. Sample: limestone and lesser amounts of silicified limestone or quartzite; trace garnet, pyrite in limestone.

Number	Type	Length	Description
DR458	Grid	n/a	Gordon Spring prospect (see fig. 50), shaft, 6-ft by 6-ft and 15-ft-deep. Sample of limestone bedrock (N. 80° W., SW. 65°) from dump.
DR459	Grab?	n/a	Gordon Spring prospect (see fig. 50), same shaft, sample as DR458. Sample collected during 1980 USBM RARE II study (sample 62 in Kreidler, 1981); pulp re-assayed in 1992. Limestone from dump, green garnet, minor limonitic stain. Interprets structural plane in shaft collar as fault, not bedding (see DR458).
DR460	Grab	not re-corded	Gordon Spring prospect (see fig. 50), pit, 4-ft-deep. Sample collected during 1980 USBM RARE II study (sample 65 in Kreidler, 1981); pulp re-assayed in 1992. Granite and limestone from dump, no alteration. Limestone bedding?: N. 65° W., SW. 55°.
DR461	Chip	8 ft	Prospect pit, size unknown (pl. 1); sample of quartz-porphyry intrusive exposed in pit's W. side.
DR462	Chip	10 ft	Prospect pit, size unknown (pl. 1), below DR461 pit (distance from not recorded), exposes bedding in limestone and quartzite (N. 65° W., SW. 85°). Sample perpendicular to bedding.
DR463	Chip	5 ft	Prospect pit (pl. 1; same pit as DR461), strongly silicified zone (N. 17° W., NE. 45°) in DR461 porphyry.
DR464	un-known	not re-corded	Prospect pit (pl. 1) exposes E.-W.-trending shear (vertical) with abundant limonitic stain and moderate amounts of hematite. Length, width of structure not known. Sample collected during 1980 USBM RARE II study (sample 108 in Kreidler, 1981); pulp re-assayed in 1992.
DR465	Grab	n/a	Prospect shaft (pl. 1), 10-ft by 10-ft and 54-ft-deep in limestone alteration around rhyolite contact. Contact is faulted, N. 70° W., vertical. Sample collected during 1980 USBM RARE II study (sample 74 in Kreidler, 1981); pulp re-assayed in 1992.
DR466	Chip	7 ft	Sala No. 2 prospect, adit (pl. 1; see mine map DR466-472, fig. 51). Granite, minor epidote. Sample collected during 1980 USBM RARE II study (sample 60 in Kreidler, 1981); pulp re-assayed in 1992.

Number	Type	Length	Description
DR467	Chip	7 ft	Sala No. 2 adit (pl. 1; see map DR466-472, fig. 51). Breccia zone. Sample collected during 1980 USBM RARE II study (sample 59 in Kreidler, 1981); pulp re-assayed in 1992.
DR468	Chip	3 ft	Sala No. 2 adit (pl. 1; see map DR466-472, fig. 51). Rhyolite, latite contact. Sample collected during 1980 USBM RARE II study (sample 58 in Kreidler, 1981); pulp re-assayed in 1992.
DR469	Chip	7 ft	Sala No. 2 adit (pl. 1; see map DR466-472, fig. 51). Rhyolite, latite contact. Sample collected during 1980 USBM RARE II study (sample 57 in Kreidler, 1981); pulp re-assayed in 1992.
DR470	Chip	4 ft	Sala No. 2 adit (pl. 1; see map DR466-472, fig. 51). Rhyolite, latite contact. Sample collected during 1980 USBM RARE II study (sample 56 in Kreidler, 1981); pulp re-assayed in 1992.
DR471	Chip	3 ft	Sala No. 2 adit (pl. 1; see map DR466-472, fig. 51). Rhyolite, breccia contact. Sample collected during 1980 USBM RARE II study (sample 55 in Kreidler, 1981); pulp re-assayed in 1992.
DR472	Chip	8 ft	Sala No. 2 adit (pl. 1; see map DR466-472, fig. 51). Breccia through rhyolite. Sample collected during 1980 USBM RARE II study (sample 54 in Kreidler, 1981); pulp re-assayed in 1992.
DR473	Grab	n/a	Prospect trench (pl. 1), trends N. 35° E., 27-ft-long, 5-ft-across, 3-ft to 8-ft-deep; only alluvium exposed in trench, probably sloughed. Sample from dump of granite and marble with malachite. Sample collected during 1980 USBM RARE II study (sample 53 in Kreidler, 1981); pulp re-assayed in 1992.
DR474	Chip	2 ft	Sala No. 1 prospect, adit (pl. 1; see mine map DR474-477, fig. 51). Granite at face, includes some marble (from fault zone?) and epidote. Sample collected during 1980 USBM RARE II study (sample 49 in Kreidler, 1981); pulp re-assayed in 1992.
DR475	Chip	6 ft	Sala No. 1 prospect (pl. 1; see map DR474-477, fig. 51). Fault through marble. Sample collected during 1980 USBM RARE II study (sample 50 in Kreidler, 1981); pulp re-assayed in 1992.

Number	Type	Length	Description
DR476	Chip	2 ft	Sala No. 1 prospect (pl. 1; see map DR474-477, fig. 51). Fault contact of breccia, marble. Sample collected during 1980 USBM RARE II study (sample 52 in Kreidler, 1981); pulp re-assayed in 1992.
DR477	Chip	11 ft	Sala No. 1 prospect (pl. 1; see map DR474-477, fig. 51). Breccia zone. Sample collected during 1980 USBM RARE II study (sample 51 in Kreidler, 1981); pulp re-assayed in 1992.

APPENDIX B.

ASSAYS OF RECONNAISSANCE ROCK-CHIP SAMPLES BY BONDAR-CLEGG AND CO., LTD. USING THE NEUTRON ACTIVATION METHOD

Element	Detection limit [lower/upper (if applicable)]
Ag (silver)	5 ppm/100 ppm
As (arsenic)	1 ppm/ -
Au (gold)	5 ppb/ -
Ba (barium)	100 ppm/ -
Br (bromine)	1 ppm/ -
Cd (cadmium)	10 ppm/ -
Ce (cerium)	10 ppm/ -
Co (cobalt)	10 ppm/ -
Cr (chromium)	50 ppm/ -
Cs (cesium)	1 ppm/ -
Eu (europium)	2 ppm/ -
Fe (iron)	0.5%/ -
Hf (hafnium)	2 ppm/ -
Ir (iridium)	100 ppb/ -
La (lanthanum)	5 ppm/ -
Lu (lutetium)	0.5 ppm/ -
Mo (molybdenum)	2 ppm/ -
Na (sodium)	0.05%/ -
Ni (nickel)	20 ppm/ -
Rb (rubidium)	10 ppm/ -
Sb (antimony)	0.2 ppm/ -
Sc (scandium)	0.5 ppm/ -
Se (selenium)	10 ppm/ -
Sm (samarium)	0.2 ppm/ -
Sn (tin)	200 ppm/ -
Ta (tantalum)	1 ppm/ -
Tb (terbium)	1 ppm/ -
Te (tellurium)	20 ppm/ -
Th (thorium)	0.5 ppm/ -
U (uranium)	0.5 ppm/ -
W (tungsten)	2 ppm/ -
Yb (ytterbium)	5 ppm/ -
Zn (zinc)	200 ppm/20,000 to 30,000 ppm
Zr (zirconium)	500 ppm

Appendix B.--Assays of reconnaissance rock-chip samples by Bondar-Clegg and Co., Ltd, using neutron activation method (Dragoon Mountains Unit). ***NOTE: CERTAIN MARBLE SAMPLES NOT ASSAYED (DR17-23, 28-29, 34-35, 39-50).***

no.	Ag (Ppm)	As (Ppm)	Au (Ppb)	Ba (Ppm)	Br (Ppm)	Cd (Ppm)	Ce (Ppm)	Co (Ppm)	Cr (Ppm)	Cs (Ppm)	Eu (Ppm)	Fe (Pct)	Hf (Ppm)	Ir (Ppb)	La (Ppm)	Lu (Ppm)	Mo (Ppm)	Na (Pct)	Ni (Ppm)	Rb (Ppm)	Sb (Ppm)	Sc (Ppm)	Se (Ppm)	Sm (Ppm)	Sn (Ppm)	Ta (Ppm)	Tb (Ppm)	Te (Ppm)	Th (Ppm)	U (Ppm)	W (Ppm)	Yb (Ppm)	Zn (Ppm)	Zr (Ppm)
DR001	6	16	47	730	* 1	14	33	* 10	* 50	5	* 2	2.5	3	* 100	14	* 0.5	140	0.08	* 20	220	4.7	3.4	* 10	2.2	* 200	* 1	* 1	* 20	10.0	1.6	12	* 5	2900	* 500
DR002	* 5	3	9	* 100	* 1	* 10	* 10	* 10	* 50	* 1	* 2	0.6	* 2	* 100	* 5	* 0.5	21	0.06	* 20	* 10	1.2	* 0.5	* 10	0.5	* 200	* 1	* 1	* 20	* 0.5	0.7	3	* 5	430	* 500
DR003	5	13	42	450	3	250	31	* 10	* 50	2	* 2	1.8	2	* 100	18	* 0.5	19	0.07	* 20	110	4.9	5.5	* 10	3.6	* 200	* 1	* 1	* 20	4.3	2.7	10	* 5	9100	* 500
DR004	* 5	198	* 5	* 100	4	1560	* 10	26	* 50	* 1	* 2	* 0.5	2	* 100	* 5	* 0.5	9	* 0.05	< 53	< 21	10.0	* 0.5	* 10	0.4	* 200	* 1	* 1	* 20	* 0.5	3.6	* 2	* 5	>30000	* 500
DR005	* 5	4	21	* 100	16	* 10	* 10	* 10	* 50	* 1	* 2	* 0.5	* 2	* 100	* 5	* 0.5	2	0.12	* 20	< 10	1.3	1.5	* 10	0.6	* 200	* 1	* 1	* 20	* 0.5	1.8	* 2	* 5	* 200	* 500
DR006	12	38	56	* 100	2	45	* 10	* 10	* 50	* 1	* 2	4.1	* 2	* 100	6	* 0.5	5	0.07	* 20	13	8.2	1.4	* 10	0.8	* 200	* 1	* 1	* 20	1.2	4.8	5	* 5	6400	* 500
DR007	* 5	24	76	210	2	17	110	19	130	6	* 2	3.7	6	* 100	41	* 0.5	5	0.13	35	250	4.4	8.4	* 10	8.3	* 200	2	2	* 20	12.0	12.0	21	6	2300	* 500
DR008	>100	86	4840	* 100	18	65	37	11	420	* 1	4	5.2	* 2	* 100	6	* 0.5	15	* 0.05	< 57	49	256.0	0.7	* 10	0.5	* 200	* 1	* 1	* 20	< 1.6	29.0	31	6	>20000	* 500
DR009	* 5	7	12	* 100	* 1	* 10	28	* 10	* 50	2	* 2	1.4	2	* 100	13	* 0.5	* 2	0.08	* 20	90	0.7	4.2	* 10	2.1	* 200	* 1	* 1	* 20	3.8	1.8	10	* 5	* 200	* 500
DR010	8	31	684	130	2	27	80	14	* 50	4	* 2	4.4	5	* 100	33	* 0.5	29	0.06	* 20	130	14.0	7.6	* 10	6.1	* 200	2	* 1	52	9.0	10.0	15	6	2900	* 500
DR011	16	53	270	300	3	65	130	22	* 50	6	2	4.7	9	* 100	49	* 0.5	12	0.09	* 20	270	14.0	13.0	* 10	8.1	* 200	2	* 1	* 20	15.0	16.0	41	7	6600	730
DR012	* 5	24	20	390	2	* 10	30	18	160	5	* 2	3.3	* 2	* 100	10	* 0.5	81	0.10	42	150	4.6	13.0	* 10	2.2	* 200	* 1	* 1	* 20	1.3	4.1	12	* 5	730	* 500
DR013	* 5	15	10	13600	2	* 10	13	* 10	* 50	7	* 2	1.2	* 2	* 100	8	* 0.5	20	* 0.05	* 20	82	1.6	4.7	* 10	1.3	* 200	* 1	* 1	* 20	1.0	3.9	3	* 5	210	* 500
DR014	* 5	16	5	120	7	* 10	19	* 10	* 50	4	* 2	1.0	3	* 100	9	* 0.5	100	* 0.05	* 20	60	1.8	2.4	* 10	1.2	* 200	* 1	* 1	* 20	2.1	2.2	5	* 5	280	* 500
DR015	* 5	7	6	* 100	2	* 10	14	* 10	* 50	2	* 2	0.7	* 2	* 100	8	* 0.5	74	* 0.05	* 20	19	1.1	1.6	* 10	1.1	* 200	* 1	* 1	* 20	1.9	3.2	* 2	* 5	* 200	* 500
DR016	* 5	8	* 5	* 100	18	* 10	21	* 10	* 50	4	* 2	0.6	* 2	* 100	6	* 0.5	11	* 0.05	* 20	41	1.8	1.8	* 10	1.1	* 200	* 1	* 1	* 20	1.5	1.4	* 2	* 5	* 200	* 500
DR024	* 5	5	* 5	260	37	* 10	44	* 10	* 50	7	* 2	1.7	* 2	* 100	18	* 0.5	3	0.34	* 20	110	0.3	7.4	* 10	2.7	* 200	* 1	* 1	* 20	5.9	2.2	2	* 5	220	* 500
DR025	* 5	4	* 5	120	* 1	* 10	32	* 10	56	5	* 2	2.7	2	* 100	17	* 0.5	* 2	0.08	29	78	0.3	6.8	* 10	2.8	* 200	* 1	* 1	* 20	5.1	2.3	* 2	* 5	* 200	* 500
DR026	* 5	25	* 5	160	1	* 10	43	* 10	61	7	* 2	3.0	3	* 100	19	* 0.5	14	0.10	* 20	100	0.4	7.9	* 10	2.9	* 200	* 1	* 1	* 20	6.2	4.9	* 2	* 5	* 200	* 500
DR027	* 5	6	* 5	* 100	4	* 10	* 10	* 10	* 50	3	* 2	* 0.5	* 2	* 100	* 5	* 0.5	3	* 0.05	* 20	17	0.9	0.6	* 10	0.4	* 200	* 1	* 1	* 20	0.7	0.8	* 2	* 5	* 200	* 500
DR030	* 5	4	* 5	* 100	2	* 10	* 10	* 10	* 50	1	* 2	* 0.5	* 2	* 100	* 5	* 0.5	2	0.08	* 20	* 10	0.4	* 0.5	* 10	0.3	* 200	* 1	* 1	* 20	0.5	0.8	* 2	* 5	* 200	* 500
DR031	* 5	* 1	* 5	* 100	* 1	* 10	19	* 10	50	3	* 2	1.2	2	* 100	11	* 0.5	* 2	0.06	24	34	0.3	2.7	* 10	1.8	* 200	* 1	* 1	* 20	2.4	1.6	3	* 5	* 200	* 500
DR032	* 5	2	* 5	* 100	5	* 10	26	* 10	* 50	4	* 2	1.3	* 2	* 100	12	* 0.5	3	0.07	* 20	60	0.3	3.8	* 10	2.2	* 200	* 1	* 1	* 20	2.5	1.4	* 2	* 5	* 200	* 500
DR033	* 5	2	* 5	120	6	* 10	20	* 10	* 50	5	* 2	1.2	* 2	* 100	8	* 0.5	5	0.06	* 20	94	0.3	4.8	* 10	1.3	* 200	* 1	* 1	* 20	3.3	2.5	2	* 5	* 200	* 500
DR036	8	4	13	130	* 1	* 10	* 10	* 10	140	* 1	* 2	0.6	* 2	* 100	* 5	* 0.5	10	* 0.05	* 20	27	2.9	0.9	* 10	0.4	* 200	* 1	* 1	* 20	0.9	1.6	4	* 5	350	* 500
DR037	* 5	2	8	* 100	* 1	* 10	* 10	* 10	100	* 1	* 2	* 0.5	* 2	* 100	* 5	* 0.5	2	* 0.05	* 20	27	0.8	0.7	* 10	0.6	* 200	* 1	* 1	* 20	0.7	1.6	3	* 5	* 200	* 500
DR038	* 5	* 1	7	* 100	* 1	* 10	* 10	* 10	* 50	* 1	* 2	* 0.5	* 2	* 100	* 5	* 0.5	* 2	* 0.05	* 20	15	0.2	* 0.5	* 10	0.4	* 200	* 1	* 1	* 20	* 0.5	1.9	* 2	* 5	* 200	* 500
DR051	* 5	51	* 5	500	2	* 10	30	* 10	* 50	4	* 2	1.7	3	* 100	14	* 0.5	5	0.91	26	310	1.7	2.4	* 10	3.9	* 200	* 1	* 1	* 20	5.0	6.6	2	* 5	* 200	* 500
DR052	* 5	2	* 5	660	* 1	* 10	91	* 10	* 50	4	* 2	2.8	5	* 100	35	* 0.5	100	1.50	* 20	270	0.3	4.4	* 10	4.4	* 200	2	* 1	* 20	16.0	6.6	5	* 5	* 200	* 500
DR053	* 5	* 1	* 5	740	* 1	* 10	68	* 10	160	4	* 2	1.2	3	* 100	29	* 0.5	10	1.30	* 50	200	0.3	3.6	* 10	4.1	* 200	2	* 1	* 20	15.0	4.0	3	* 5	530	* 500
DR054	* 5	1	* 5	730	* 1	* 10	99	* 10	* 50	9	* 2	3.6	5	* 100	38	* 0.5	80	1.40	* 20	400	* 0.2	7.3	* 10	4.4	* 200	2	* 1	* 20	18.0	10.0	6	* 5	* 200	* 500
DR055	* 5	* 1	* 5	710	* 1	16	56	* 10	170	6	* 2	2.0	3	* 100	26	* 0.5	34	1.10	* 50	230	0.6	3.9	* 10	3.5	* 200	1	* 1	* 20	16.0	5.5	7	* 5	2900	* 500
DR056	* 5	* 1	* 5	120	* 1	* 10	84	* 10	220	4	* 2	5.4	8	* 100	44	* 0.5	4	1.40	49	85	0.3	13.0	* 10	6.0	* 200	1	* 1	* 20	12.0	8.7	* 2	* 5	620	* 500
DR057	* 5	4	6	240	2	* 10	110	16	240	13	4	7.7	5	* 100	65	0.7	13	0.14	53	59	0.6	17.0	* 10	13.0	* 200	* 1	2	* 20	16.0	6.8	17	8	2600	530
DR058	* 5	2	* 5	520	2	* 10	58	* 10	110	7	* 2	3.9	6	* 100	35	* 0.5	7	0.56	34	86	1.0	7.7	* 10	5.5	* 200	* 1	* 1	* 20	8.1	8.2	6	* 5	950	* 500
DR059	* 5	5	* 5	700	7	* 10	170	19	690	23	10	10.0	* 2	* 100	120	* 0.5	26	0.40	120	220	0.8	18.0	* 10	25.7	* 200	1	4	* 20	25.0	30.0	28	12	4000	* 500
DR060	* 5	2	* 5	* 100	* 1	* 10	190	* 10	360	3	* 2	6.2	6	* 100	110	0.8	* 2	0.27	* 50	52	0.4	10.0	* 10	14.0	* 200	* 1	2	* 20	17.0	27.0	4	* 5	770	770
DR061	* 5	* 1	* 5	* 100	* 1	* 10	25	* 10	110	4	* 2	6.2	3	* 100	18	* 0.5	* 2	0.55	* 50	72	0.3	4.7	* 10	4.8	* 200	* 1	* 1	* 20	4.6	14.0	10	* 5	640	* 500
DR062	5	* 1	* 5	* 100	* 1	* 10	10	* 10	420	10	* 2	4.2	2	* 100	9	* 0.5	6	1.00	* 20	180	* 0.2	3.0	* 10	2.3	* 200	* 1	* 1	* 20	2.0	2.9	6	* 5	1000	* 500
DR063	* 5	2	* 5	* 100	* 1	* 10	18	18	750	12	* 2	9.1	* 2	* 100	9	* 0.5	9	0.10	52	140	0.3	1.8	* 10	1.9	* 200	* 1	* 1	* 20	0.9	4.7	12	* 5	1000	* 500
DR064	* 5	2	* 5	180	* 1	* 10	78	14	340	4	2	5.8	4	* 100	34	* 0.5	4	1.10	* 20	130	0.3	10.0	* 10	6.3	* 200	2	1	* 20	8.5	6.5	10	* 5	600	* 500
DR065	* 5	1	7	170	* 1	* 10	48	* 10	170	5	* 2	3.1	3	* 100	22	* 0.5	3	1.20	* 50	110	0.2	8.8	* 10	4.0	* 200	1	* 1	* 20	8.2	5.5	7	* 5	1000	* 500
DR066	* 5	* 1	7	150	* 1	* 10	35	* 10	460	2	* 2	1.6	3	* 100	15	* 0.5	5	0.82	* 50	39	0.6	2.1	* 10	3.2	* 200	* 1	* 1	* 20	8.3	2.1	2	* 5	* 200	* 500
DR067	* 5	1	7	420	* 1	* 10	60	* 10	* 50	6	* 2	2.9	4	* 100	27	* 0.5	180	2.50	* 20	220	0.6	8.0	* 10	5.0	* 200	1	* 1	* 20	10.0	4.7	3	* 5	430	* 500
DR068	82	14	61	* 100	1	* 10	* 10	* 10	67	7	* 2	2.4	3	* 100	13	* 0.5	86	0.06	* 20	15	4.8	2.9	* 10	0.6	* 200	* 1	* 1	* 20	2.7	21.0	170	* 5	13000	* 500
DR069	* 5	3	20	* 100	* 1	* 10	* 10	17	* 50	1	* 2	>10.0	* 2	* 100	5	* 0.5	29	0.13	* 20	* 10	0.3	1.3	* 10	0.5	* 200	* 1	* 1	* 20	0.5	14.0	22	* 5	1200	* 500
DR070	* 5	2	9	* 100	* 1	* 10	29	23	* 50	2	* 2	4.1	* 2	* 100	9	* 0.5	31	1.90	* 20	120	0.4	2.4	* 10	1.8	* 200	2	* 1	* 20	3.0	4.3	3	* 5	290	* 500
DR071	* 5	2	* 5	120	* 1	* 10	63	21	* 50	41	* 2	5.6	* 2	* 100	25	* 0.5	11	2.40	25	450	0.8	11.0	* 10	4.9	* 200	5	* 1	* 20	11.0	16.0	11	* 5	1800	* 500
DR072	* 5	3	* 5	* 100	* 1	* 10	24	12	* 50	1	* 2	6.8	2	* 100	12	* 0.5	12	0.13	* 20	19	0.4	3.0	* 10	2.4	* 200	* 1	* 1	* 20	3.0	9.0	12	* 5	630	* 500
DR073	* 5	2	* 5	420	* 1	* 10	75	* 10	82	14	* 2	4.3	10	* 100	34	* 0.5	7	1.30	* 20	380	0.2	12.0	* 10	5.7	* 200	2	* 1	* 20	14.0	2.8	32	* 5	250	1000

Appendix B. con't.

no.	Ag (Ppm)	As (Ppm)	Au (Ppb)	Ba (Ppm)	Br (Ppm)	Cd (Ppm)	Ce (Ppm)	Co (Ppm)	Cr (Ppm)	Cs (Ppm)	Eu (Ppm)	Fe (Pct)	Hf (Ppm)	Ir (Ppb)	La (Ppm)	Lu (Ppm)	Mo (Ppm)	Na (Pct)	Ni (Ppm)	Rb (Ppm)	Sb (Ppm)	Sc (Ppm)	Se (Ppm)	Sm (Ppm)	Sn (Ppm)	Ta (Ppm)	Tb (Ppm)	Te (Ppm)	Th (Ppm)	U (Ppm)	W (Ppm)	Yb (Ppm)	Zn (Ppm)	Zr (Ppm)
DR074	* 5	32	* 5	790	* 1	* 10	97	16	50	15	* 2	5.1	6	* 100	42	0.7	* 2	1.00	* 20	380	0.8	20.0	* 10	7.9	* 200	2	* 1	* 20	14.0	3.1	21	6	210	* 500
DR075	* 5	* 1	* 5	580	* 1	* 10	90	13	150	13	* 2	3.7	5	* 100	39	0.7	* 2	0.87	* 50	260	0.2	14.0	* 10	8.4	* 200	1	2	* 20	13.0	3.4	16	* 5	410	* 500
DR076	8	6	* 5	530	* 1	310	92	14	* 50	7	* 2	6.3	9	* 100	41	0.6	10	0.17	* 20	320	3.2	12.0	* 10	5.6	* 200	2	* 1	* 20	15.0	5.1	11	7	>30000	* 500
DR077	* 5	5	8	550	* 1	* 10	72	* 10	150	10	* 2	4.5	9	* 100	30	0.8	10	0.14	* 50	260	2.1	9.2	* 10	5.6	* 200	2	1	* 20	11.0	5.0	21	* 5	1000	* 500
DR078	* 5	6	* 5	730	* 1	86	94	14	120	19	* 2	4.9	8	* 100	37	0.6	* 2	0.18	* 50	380	1.7	9.3	* 10	6.7	* 200	2	* 1	* 20	14.0	5.2	22	* 5	6900	* 500
DR079	7	6	* 5	630	* 1	34	120	15	63	18	* 2	6.8	10	* 100	54	0.7	6	0.26	37	400	1.8	14.0	* 10	8.8	* 200	3	1	* 20	15.0	5.6	21	8	4900	520
DR080	27	3	* 5	* 100	* 1	220	54	51	110	40	* 2	8.0	2	* 100	39	* 0.5	13	0.05	* 20	25	2.7	7.4	* 10	6.7	* 200	* 1	1	* 20	5.4	2.6	71	* 5	>30000	* 500
DR081	* 5	2	* 5	210	* 1	180	34	24	170	32	* 2	3.9	* 2	* 100	28	* 0.5	6	< 0.12	* 50	140	0.9	5.6	* 10	4.7	* 200	* 1	* 1	* 20	5.1	2.3	39	* 5	>20000	* 500
DR082	29	* 1	* 5	160	3	24	27	120	* 50	40	* 2	>10.0	30	* 100	22	0.7	217	0.14	* 20	52	1.4	4.5	* 10	3.5	* 200	* 1	* 1	* 20	3.4	7.5	1670	* 5	4600	* 500
DR083	* 5	3	8	660	3	* 10	210	10	* 50	7	3	5.4	6	* 100	64	* 0.5	28	1.20	* 20	280	5.0	9.4	* 10	10.0	* 200	2	1	* 20	42.0	13.0	11	* 5	1300	590
DR084	45	5	23	310	* 1	31	140	23	90	10	5	4.6	4	* 100	75	1.8	22	1.10	48	170	1.9	9.2	* 10	18.0	* 200	1	3	* 20	45.0	9.1	21	16	5500	* 500
DR085	* 5	* 1	* 5	410	3	* 10	72	13	* 50	14	* 2	3.7	5	* 100	30	* 0.5	* 2	0.83	* 20	310	0.7	15.0	* 10	5.0	* 200	1	* 1	* 20	10.0	4.1	9	* 5	500	* 500
DR086	26	17	7	* 100	* 1	28	44	48	140	9	* 2	5.6	* 2	* 100	26	0.6	75	0.20	* 50	100	2.2	4.8	* 10	6.5	* 200	* 1	1	* 20	9.3	15.0	59	* 5	3000	* 500
DR087	63	7	15	* 100	1	220	24	85	270	13	2	>10.0	4	* 100	55	1.7	150	0.10	< 41	28	1.3	2.4	* 10	10.0	* 200	* 1	3	* 20	0.9	24.0	150	18	18000	* 500
DR088	10	* 1	* 5	160	* 1	17	17	19	95	19	* 2	2.9	* 2	* 100	12	* 0.5	* 2	0.24	* 50	130	0.4	4.1	* 10	2.2	* 200	* 1	* 1	* 20	4.3	3.2	19	* 5	3400	* 500
DR089	* 5	1	* 5	170	* 1	* 10	40	* 10	55	5	* 2	2.1	3	* 100	19	* 0.5	* 2	1.20	* 20	130	1.0	5.1	* 10	3.0	* 200	* 1	* 1	* 20	6.5	3.0	3	* 5	750	* 500
DR090	* 5	1	* 5	* 100	* 1	* 10	23	* 10	390	* 1	* 2	0.7	4	* 100	10	* 0.5	5	0.63	* 50	* 10	0.3	1.6	* 10	2.4	* 200	* 1	* 1	* 20	7.5	2.0	9	* 5	690	* 500
DR091	* 5	* 1	* 5	160	* 1	13	65	* 10	190	2	* 2	1.1	14	* 100	25	0.6	7	4.10	* 50	* 10	0.3	5.4	* 10	5.3	* 200	2	* 1	* 20	14.0	5.4	17	* 5	2300	570
DR092	* 5	66	11	300	1	57	81	16	* 50	28	* 2	>10.0	5	* 100	35	* 0.5	110	0.34	* 20	360	3.5	7.6	* 10	3.7	* 200	1	* 1	* 20	19.0	6.4	43	* 5	22500	* 500
DR093	11	21	* 5	* 100	1	58	32	* 10	* 50	13	* 2	>10.0	4	* 100	15	* 0.5	19	* 0.05	* 20	110	5.7	6.5	* 10	1.4	* 200	* 1	* 1	* 20	6.1	17.0	92	* 5	>30000	* 500
DR094	* 5	7	* 5	980	* 1	16	91	* 10	* 50	24	* 2	7.5	6	* 100	38	* 0.5	18	1.10	* 20	460	1.2	8.7	* 10	4.2	* 200	2	* 1	* 20	21.0	7.1	15	5	18000	* 500
DR095	25	36	8	670	1	94	54	11	* 50	21	* 2	>10.0	5	* 100	28	* 0.5	95	0.60	* 20	300	6.8	7.3	21	2.6	* 200	1	* 1	* 20	13.0	22.0	50	* 5	>30000	* 500
DR096	42	3	* 5	* 100	* 1	27	81	24	91	* 1	* 2	7.5	5	* 100	46	0.9	* 2	0.05	* 20	* 10	1.2	12.0	* 10	8.3	* 200	1	* 1	* 20	12.0	4.0	13	6	4700	* 500
DR097	* 5	* 1	* 5	310	* 1	210	86	35	51	4	* 2	5.6	6	* 100	44	0.9	4	0.33	* 20	140	0.9	11.0	* 10	7.3	* 200	2	1	* 20	13.0	3.3	27	6	>30000	* 500
DR098	12	3	* 5	* 100	2	890	85	120	* 50	4	* 2	4.3	5	* 100	35	0.7	5	0.19	< 52	78	1.7	7.4	* 10	6.5	* 200	1	* 1	* 20	8.5	2.6	25	* 5	>30000	* 500
DR099	* 5	3	10	810	* 1	23	150	27	64	14	* 2	6.3	10	* 100	63	0.9	7	1.10	* 20	350	3.6	16.0	* 10	12.0	* 200	3	2	* 20	19.0	5.6	13	8	3400	510
DR100	* 5	1	* 5	* 100	2	940	76	150	* 50	2	* 2	4.6	5	* 100	31	* 0.5	* 2	0.13	< 54	42	2.4	6.4	* 10	7.0	* 200	1	* 1	* 20	10.0	3.5	4	6	>30000	* 500
DR101	* 5	3	* 5	170	1	50	69	21	150	3	* 2	5.4	7	* 100	33	0.8	8	1.00	* 20	56	1.2	7.8	* 10	7.0	* 200	1	1	* 20	11.0	3.8	9	6	9900	640
DR102	< 10	* 1	* 5	* 100	7	1130	67	180	* 50	2	* 2	4.4	6	* 100	33	* 0.5	10	0.07	< 59	< 25	1.2	6.2	* 10	6.1	* 200	2	* 1	* 20	8.2	2.5	130	* 5	>30000	* 500
DR103	19	1	* 5	* 100	* 1	700	60	110	110	* 1	* 2	5.4	3	* 100	28	* 0.5	6	0.08	* 50	* 10	0.6	4.8	* 10	6.2	* 200	2	* 1	* 20	10.0	4.5	52	* 5	>20000	* 500
DR104	16	2	8	190	2	470	77	85	95	3	* 2	3.7	7	* 100	26	0.5	6	0.11	67	52	0.9	5.5	* 10	6.7	* 200	2	1	* 20	10.0	4.6	57	* 5	>20000	* 500
DR105	* 5	* 1	* 5	390	* 1	10	73	* 10	140	3	* 2	2.5	8	* 100	30	0.6	* 2	0.60	* 50	110	0.5	6.7	* 10	6.6	* 200	2	1	* 20	13.0	4.6	4	* 5	400	* 500
DR106	* 5	* 1	* 5	190	* 1	* 10	36	* 10	430	2	* 2	0.7	11	* 100	13	0.5	4	0.30	* 50	58	0.5	1.7	* 10	3.0	* 200	1	* 1	* 20	10.0	3.4	9	* 5	290	* 500
DR107	* 5	3	* 5	380	* 1	* 10	100	17	* 50	7	* 2	4.1	6	* 100	43	0.7	* 2	0.31	* 20	200	2.6	10.0	* 10	8.3	* 200	2	1	* 20	12.0	3.4	14	6	1500	* 500
DR108	9	4	7	190	* 1	110	96	38	160	3	* 2	8.3	6	* 100	43	1.1	27	0.11	* 20	71	0.9	9.4	* 10	8.6	* 200	1	2	* 20	11.0	4.2	16	7	25400	* 500
DR109	31	3	11	* 100	* 1	420	83	70	69	1	* 2	3.9	4	* 100	32	* 0.5	79	0.06	* 50	30	0.7	6.7	* 10	7.6	* 200	2	1	* 20	10.0	4.1	9	* 5	>20000	* 500
DR110	22	2	11	110	* 1	310	100	55	* 50	3	* 2	4.8	7	* 100	51	0.7	29	0.10	* 20	61	1.4	8.7	* 10	8.8	* 200	2	1	* 20	13.0	3.9	8	6	>30000	* 500
DR111	* 5	2	10	550	* 1	* 10	70	* 10	91	23	* 2	2.4	10	* 100	28	* 0.5	* 2	0.46	* 50	190	2.2	10.0	* 10	5.5	* 200	1	* 1	* 20	9.3	5.8	6	* 5	830	790
DR112	71	5	35	< 240	3	>2000	48	130	* 50	3	* 2	* 0.5	* 2	* 100	* 5	* 0.5	6	0.11	< 120	< 49	48.9	1.8	< 21	* 0.2	* 200	* 1	* 1	* 20	< 1.4	* 0.5	< 4	* 5	>20000	< 1700
DR113	73	5	59	* 100	2	1640	33	76	91	* 1	* 2	* 0.5	* 2	* 100	8	* 0.5	7	0.11	140	56	36.9	1.5	* 10	0.7	* 200	* 1	2	* 20	1.0	0.9	* 2	* 5	>20000	< 1200
DR114	* 5	2	* 5	350	5	* 10	46	11	280	38	* 2	3.2	5	* 100	25	* 0.5	* 2	0.08	47	300	1.4	10.0	* 10	4.6	* 200	* 1	* 1	* 20	9.2	3.3	3	* 5	900	* 500
DR115	* 5	* 1	* 5	350	* 1	* 10	26	* 10	62	23	* 2	1.9	* 2	* 100	15	* 0.5	* 2	0.13	* 50	170	0.7	6.3	* 10	2.5	* 200	* 1	* 1	* 20	4.3	2.2	2	* 5	* 200	* 500
DR116	* 5	1	* 5	390	* 1	* 10	30	* 10	82	18	* 2	1.4	2	* 100	15	* 0.5	* 2	0.17	* 50	170	0.9	5.5	* 10	3.7	* 200	* 1	* 1	* 20	6.4	2.8	4	* 5	950	600
DR117	> 50	3	29	* 100	< 3	>2000	35	89	< 100	< 2	* 2	* 0.5	* 2	* 100	* 5	0.8	* 2	* 0.05	< 71	< 22	53.7	1.5	* 10	0.2	< 420	* 1	1	< 40	< 1.0	* 0.5	< 5	* 5	>20000	< 1500
DR118	> 50	2	19	900	1	250	56	37	120	5	* 2	2.3	7	* 100	25	* 0.5	* 2	0.55	* 50	170	1.1	8.4	* 10	4.9	* 200	* 1	* 1	* 20	8.7	4.7	* 2	* 5	>20000	* 500
DR119	* 5	9	* 5	1400	1	* 10	140	55	610	10	5	7.4	7	* 100	50	* 0.5	* 2	1.00	280	240	1.6	22.0	* 10	9.2	* 200	1	2	* 20	7.6	2.6	6	* 5	1800	* 500
DR120	* 5	6	* 5	1400	* 1	* 10	110	53	600	19	* 2	7.6	7	* 100	48	* 0.5	* 2	2.50	310	190	1.5	20.0	* 10	8.8	* 200	* 1	* 1	* 20	7.0	2.4	* 2	* 5	540	* 500
DR121	9	41	33	1800	2	* 10	44	35	92	5	* 2	10.0	5	* 100	20	* 0.5	244	0.48	* 20	540	18.0	5.6	* 10	3.7	* 200	3	* 1	* 20	16.0	6.9	47	* 5	4800	* 500
DR122	74	22	16	1100	11	28	120	150	* 50	10	* 2	6.1	32	* 100	62	* 0.5	70	0.45	< 62	570	95.6	16.0	* 10	6.9	* 200	* 1	* 1	* 20	5.8	17.0	1760	9	>20000	* 500
DR123	> 50	12	260	750	5	13	10	33	150	3	* 2	1.6	* 2	* 100	16	* 0.5	249	0.13	* 50	320	68.2	1.9	32	0.5	* 200	2	* 1	* 20	13.0	37.0	40	* 5	4200	* 500
DR124	160	37	240	1200	11	10	39	47	* 50	7	* 2	1.4	* 2	* 100	14	* 0.5	337	0.26	* 20	630	117.0	1.5	29	< 1.2	* 200	3	* 1	< 48	16.0	45.0	12	* 5	20000	* 500
DR125	>100	49	40	780	7	210	80	120	* 50	4	4	10.0	8	* 100	51	* 0.5	280	0.16	< 51	300	80.8	7.0	* 10	4.6	* 200	* 1	* 1	* 20	4.3	21.0	180	7	>20000	* 500
DR126	16	35	26	900	2	30	81	51	* 50	9	* 2	6.8	10	* 100	45	* 0.5	120	1.50	* 20	310	17.0	12.0	* 10	6.8	* 200	* 1	1	* 20	6.4	6.8	140	* 5	10000	* 500

Appendix B. con't.

no.	Ag (Ppm)	As (Ppm)	Au (Ppb)	Ba (Ppm)	Br (Ppm)	Cd (Ppm)	Ce (Ppm)	Co (Ppm)	Cr (Ppm)	Cs (Ppm)	Eu (Ppm)	Fe (Pct)	Hf (Ppm)	Ir (Ppb)	La (Ppm)	Lu (Ppm)	Mo (Ppm)	Na (Pct)	Ni (Ppm)	Rb (Ppm)	Sb (Ppm)	Sc (Ppm)	Se (Ppm)	Sm (Ppm)	Sn (Ppm)	Ta (Ppm)	Tb (Ppm)	Te (Ppm)	Th (Ppm)	U (Ppm)	W (Ppm)	Yb (Ppm)	Zn (Ppm)	Zr (Ppm)
DR127	> 50	49	16	1000	* 1	* 10	130	34	110	12	* 2	>10.0	10	* 100	63	* 0.5	9	< 0.31	* 50	290	12.0	12.0	12	7.9	* 200	1	* 1	* 20	10.0	16.0	22	* 5	15000	530
DR128	10	5	* 5	900	2	13	110	19	* 50	14	4	5.2	4	* 100	41	* 0.5	* 2	3.50	37	360	1.3	16.0	* 10	7.4	* 200	* 1	2	* 20	9.0	1.8	* 2	* 5	760	* 500
DR129	13	5	* 5	1300	* 1	50	92	28	* 50	9	* 2	3.2	5	* 100	41	* 0.5	6	2.50	* 20	580	1.3	15.0	* 10	7.3	* 200	* 1	* 1	* 20	7.8	2.9	7	* 5	8600	960
DR130	28	18	* 5	* 100	5	21	37	20	* 50	1	* 2	5.8	7	* 100	21	* 0.5	17	0.08	34	15	7.9	5.5	* 10	1.3	* 200	* 1	* 1	* 20	3.8	31.0	231	* 5	3800	* 500
DR131	66	18	110	190	2	170	43	23	* 50	5	* 2	>10.0	2	* 100	21	* 0.5	15	0.34	* 20	120	7.7	11.0	* 10	3.3	* 200	* 1	* 1	* 20	2.1	2.7	6	* 5	>30000	* 500
DR132	10	3	* 5	2100	* 1	* 10	160	27	* 50	20	5	4.3	9	* 100	69	* 0.5	* 2	0.65	* 20	760	2.1	15.0	* 10	13.0	* 200	* 1	2	* 20	13.0	3.9	8	* 5	520	* 500
DR133	* 5	5	* 5	660	* 1	47	71	19	150	11	2	4.7	4	* 100	30	* 0.5	5	1.00	100	320	1.5	18.0	* 10	5.7	* 200	* 1	1	* 20	3.9	2.0	5	* 5	7400	* 500
DR134	* 5	1	7	690	1	* 10	91	* 10	320	11	* 2	2.1	4	* 100	36	* 0.5	5	2.00	* 20	380	0.6	6.7	* 10	5.6	* 200	2	* 1	* 20	13.0	3.0	7	* 5	610	* 500
DR135	* 5	3	* 5	210	* 1	* 10	55	* 10	1000	6	* 2	1.9	10	* 100	19	* 0.5	8	0.15	* 20	280	1.1	2.4	* 10	3.7	* 200	2	* 1	* 20	16.0	4.0	9	* 5	530	* 500
DR136	* 5	7	7	330	* 1	* 10	77	* 10	80	9	* 2	2.1	8	* 100	35	* 0.5	5	0.38	* 50	230	2.1	7.4	* 10	6.1	* 200	2	1	* 20	12.0	4.8	4	* 5	1400	* 500
DR137	* 5	14	15	630	2	* 10	76	22	56	13	* 2	6.1	4	* 100	33	* 0.5	* 2	1.00	37	420	1.8	17.0	* 10	5.7	* 200	1	* 1	* 20	11.0	3.6	12	* 5	2300	* 500
DR138	* 5	5	5	210	2	* 10	58	* 10	* 50	7	* 2	1.5	9	* 100	20	* 0.5	4	0.11	* 20	170	2.4	3.3	* 10	3.6	* 200	1	* 1	* 20	10.0	3.4	6	* 5	1100	* 500
DR139	* 5	17	27	480	* 1	38	61	24	90	16	2	8.4	9	* 100	27	* 0.5	* 2	0.21	* 20	430	5.5	20.0	* 10	6.1	* 200	* 1	* 1	* 20	6.4	3.3	21	* 5	5000	540
DR140	11	20	* 5	290	* 1	11	46	13	66	8	* 2	7.3	4	* 100	20	* 0.5	* 2	0.15	* 20	290	3.0	7.9	* 10	4.3	* 200	1	* 1	* 20	6.9	3.1	32	* 5	4600	* 500
DR141	12	18	10	* 100	2	18	51	13	140	5	* 2	6.7	17	* 100	24	* 0.5	9	0.06	* 20	150	6.6	5.7	* 10	4.9	* 200	1	* 1	* 20	11.0	5.5	39	* 5	6600	890
DR142	32	12	32	* 100	7	11	20	72	* 50	5	* 2	>10.0	* 2	* 100	10	* 0.5	17	0.10	* 20	85	3.2	7.2	* 10	2.6	* 200	* 1	* 1	* 20	0.9	2.8	39	* 5	15000	* 500
DR143	18	12	24	* 100	* 1	260	38	13	* 50	9	* 2	8.8	4	* 100	17	* 0.5	220	0.09	* 20	290	2.5	5.1	* 10	3.3	* 200	* 1	* 1	* 20	5.2	4.6	5	* 5	>30000	* 500
DR144	50	5	170	* 100	* 1	340	31	* 10	* 50	15	* 2	6.4	* 2	* 100	14	* 0.5	18	0.12	* 20	250	3.9	3.9	* 10	2.4	* 200	* 1	* 1	* 20	4.0	5.1	4	* 5	>30000	* 500
DR145	32	5	130	* 100	* 1	510	21	15	140	7	* 2	10.0	5	* 100	14	* 0.5	17	0.10	76	140	6.2	3.1	* 10	2.8	* 200	* 1	* 1	* 20	4.1	5.8	10	* 5	>20000	* 500
DR146	9	6	15	* 100	7	240	22	* 10	* 50	10	* 2	1.7	* 2	* 100	15	* 0.5	14	0.11	* 20	100	5.3	4.9	* 10	2.3	* 200	* 1	* 1	* 20	4.2	3.6	4	* 5	>30000	* 500
DR147	19	3	38	* 100	* 1	760	24	* 10	* 50	2	* 2	1.1	* 2	* 100	5	* 0.5	444	0.06	* 20	27	1.6	2.3	* 10	1.1	* 200	* 1	* 1	* 20	* 0.5	0.8	4	* 5	>30000	* 500
DR148	32	2	30	* 100	2	280	12	* 10	* 50	2	* 2	0.7	* 2	* 100	* 5	* 0.5	18	0.06	* 20	49	11.0	* 0.5	* 10	0.4	* 200	* 1	* 1	* 20	* 0.5	0.7	24	* 5	>30000	* 500
DR149	23	5	200	* 100	* 1	680	30	22	* 50	2	* 2	11.0	4	* 100	9	* 0.5	6	0.15	* 50	46	10.0	2.4	* 10	2.1	* 200	* 1	* 1	* 20	4.6	6.1	11	* 5	>30000	* 500
DR150	* 5	9	* 5	220	* 1	* 10	38	* 10	150	8	* 2	4.3	7	* 100	15	0.6	3	0.06	* 50	180	1.7	4.2	* 10	4.1	* 200	2	* 1	* 20	16.0	8.6	24	* 5	300	* 500
DR151	* 5	11	* 5	* 100	* 1	* 10	77	15	92	4	* 2	>10.0	9	* 100	39	1.1	31	* 0.05	* 20	56	2.5	8.4	* 10	7.1	* 200	2	* 1	* 20	10.0	6.4	96	7	1600	* 500
DR152	* 5	* 1	* 5	160	10	* 10	* 10	10	* 50	21	* 2	5.2	5	* 100	8	0.7	31	* 0.05	* 20	460	* 0.2	0.6	* 10	1.3	* 200	* 1	* 1	* 20	* 0.5	* 0.5	1950	* 5	400	730
DR153	* 5	4	* 5	* 100	1	* 10	* 10	13	* 50	8	* 2	>10.0	* 2	* 100	11	* 0.5	4	0.07	* 20	150	1.6	1.3	* 10	1.6	* 200	* 1	* 1	* 20	* 0.5	1.6	201	* 5	1100	* 500
DR154	* 5	3	* 5	110	4	* 10	* 10	18	98	11	* 2	>10.0	* 2	* 100	10	0.6	22	* 0.05	28	210	1.6	1.2	* 10	1.6	* 200	* 1	* 1	* 20	* 0.5	1.7	863	* 5	560	* 500
DR155	6	* 1	* 5	* 100	3	* 10	* 10	12	* 50	* 1	* 2	>10.0	* 2	* 100	6	* 0.5	31	* 0.05	* 20	* 10	0.7	1.1	* 10	0.8	* 200	* 1	* 1	* 20	* 0.5	2.3	743	* 5	240	* 500
DR156	* 5	4	* 5	410	* 1	* 10	92	12	170	8	3	8.7	8	* 100	46	0.9	12	0.14	* 20	320	2.6	11.0	* 10	8.2	* 200	2	1	* 20	15.0	6.3	7	7	* 200	580
DR157	* 5	17	* 5	* 100	* 1	* 10	* 10	* 10	* 50	1	* 2	2.6	* 2	* 100	10	* 0.5	7	* 0.05	* 20	25	1.2	1.2	* 10	1.2	* 200	* 1	* 1	* 20	0.9	1.3	68	* 5	1500	* 500
DR158	* 5	3	* 5	* 100	* 1	* 10	17	* 10	91	3	* 2	>10.0	4	* 100	14	* 0.5	* 2	* 0.05	* 20	83	4.2	6.7	* 10	2.0	* 200	4	* 1	* 20	30.0	28.0	25	* 5	* 200	* 500
DR159	30	3	* 5	* 100	* 1	1240	16	360	170	* 1	2	8.7	* 2	* 100	24	* 0.5	* 2	0.05	< 82	< 22	1.8	4.1	* 10	3.4	* 200	* 1	* 1	* 20	3.1	1.3	* 2	* 5	>30000	< 1200
DR160	* 5	3	* 5	* 100	* 1	58	42	32	200	2	2	9.2	6	* 100	28	* 0.5	7	0.06	* 20	26	2.3	7.5	* 10	4.2	* 200	* 1	* 1	* 20	6.1	5.7	130	* 5	14000	570
DR161	* 5	16	22	* 100	* 1	580	37	180	170	* 1	* 2	7.2	6	* 100	29	* 0.5	200	0.06	43	* 10	3.0	7.9	* 10	4.9	* 200	2	* 1	* 20	19.0	14.0	89	* 5	>30000	* 500
DR162	< 11	7	9	* 100	* 1	1110	18	320	110	2	* 2	4.2	* 2	* 100	12	* 0.5	4	* 0.05	< 61	< 21	0.9	2.1	* 10	2.1	* 200	* 1	* 1	* 20	1.1	1.5	35	* 5	>30000	< 1000
DR163	* 5	5	* 5	* 100	1	130	37	49	130	2	* 2	8.0	3	* 100	21	* 0.5	4	* 0.05	* 20	* 10	1.3	6.0	* 10	4.1	* 200	1	* 1	* 20	6.2	2.8	17	* 5	24500	630
DR164	* 5	5	19	* 100	* 1	810	15	240	220	3	* 2	7.6	* 2	* 100	21	* 0.5	10	* 0.05	< 47	* 10	1.3	3.8	* 10	3.2	* 200	* 1	* 1	* 20	2.9	2.8	180	* 5	>30000	* 500
DR165	* 5	2	* 5	840	* 1	18	120	19	300	20	2	4.8	5	* 100	61	1.0	5	0.26	* 20	540	0.6	22.0	* 10	12.0	* 200	1	2	* 20	15.0	3.6	14	7	5100	* 500
DR166	10	* 1	* 5	* 100	3	140	* 10	62	92	3	* 2	>10.0	3	* 100	9	* 0.5	14	0.06	* 20	53	1.1	2.1	* 10	1.5	* 200	* 1	* 1	* 20	2.2	2.7	727	* 5	>30000	* 500
DR167	* 5	4	* 5	* 100	* 1	71	11	43	120	* 1	* 2	>10.0	* 2	* 100	16	* 0.5	72	0.09	* 20	* 10	2.2	4.1	* 10	2.4	* 200	* 1	* 1	* 20	2.7	5.8	34	* 5	16000	* 500
DR168	* 5	4	* 5	* 100	* 1	* 10	60	30	150	* 1	* 2	>10.0	5	* 100	35	* 0.5	21	0.08	* 20	* 10	2.7	9.4	* 10	5.7	* 200	* 1	* 1	* 20	5.2	2.6	24	* 5	620	* 500
DR169	* 5	3	* 5	* 100	* 1	* 10	31	28	120	* 1	* 2	>10.0	3	* 100	20	* 0.5	16	0.08	* 20	* 10	1.4	5.5	* 10	3.9	* 200	* 1	* 1	* 20	5.1	4.1	26	* 5	1000	* 500
DR170	* 5	4	* 5	* 100	* 1	* 10	26	29	130	* 1	* 2	>10.0	3	* 100	16	* 0.5	6	* 0.05	* 20	* 10	1.4	3.4	* 10	3.0	* 200	* 1	* 1	* 20	3.7	1.9	33	* 5	320	* 500
DR171	* 5	9	* 5	* 100	* 1	15	100	72	* 50	8	* 2	>10.0	5	* 100	48	* 0.5	12	0.06	* 20	22	1.7	6.0	* 10	6.7	* 200	1	* 1	* 20	9.4	3.5	69	* 5	5900	* 500
DR172	* 5	5	27	450	* 1	12	80	63	670	10	* 2	6.3	4	* 100	32	* 0.5	24	0.66	130	270	1.9	27.0	* 10	6.7	* 200	* 1	* 1	* 20	4.3	4.6	12	5	1400	* 500
DR173	24	3	* 5	* 100	* 1	* 10	39	30	190	33	* 2	7.4	* 2	* 100	29	* 0.5	6	0.06	* 20	650	1.6	6.1	* 10	4.6	* 200	* 1	* 1	* 20	5.1	5.3	4	* 5	6500	* 500
DR174	66	4	9	* 100	* 1	* 10	58	50	160	21	* 2	>10.0	4	* 100	41	0.6	6	0.05	* 20	400	1.7	7.0	* 10	6.5	* 200	* 1	* 1	* 20	6.0	6.4	7	* 5	8300	* 500
DR175	100	6	11	* 100	* 1	26	76	15	510	* 1	* 2	4.7	3	* 100	39	0.7	653	* 0.05	* 20	11	2.0	6.1	* 10	6.4	* 200	1	* 1	* 20	7.9	4.4	9	* 5	6700	* 500
DR176	* 5	4	* 5	680	* 1	* 10	49	* 10	110	3	2	5.6	6	* 100	28	0.6	2	0.29	* 20	130	3.1	16.0	* 10	5.3	* 200	1	* 1	* 20	8.3	3.6	8	* 5	310	* 500
DR177	* 5	4	* 5	660	* 1	* 10	77	11	190	7	* 2	3.3	4	* 100	44	* 0.5	6	0.12	* 20	220	1.3	6.2	* 10	5.1	* 200	* 1	* 1	* 20	7.5	2.3	11	* 5	400	* 500
DR178	* 5	2	* 5	* 100	* 1	* 10	39	* 10	640	* 1	* 2	1.6	4	* 100	17	* 0.5	5	* 0.05	* 20	17	0.9	1.8	* 10	2.8	* 200	* 1	* 1	* 20	6.9	1.5	12	* 5	330	* 500
DR179	11	3	* 5	* 100	* 1	* 10	24	43	85	8	* 2	>10.0	* 2	* 100	22	* 0.5	7	* 0.05	* 20	* 10	1.4	4.3	* 10	3.1	* 200	* 1	* 1	* 20	5.0	4.0	46	* 5	5300	* 500

Appendix B, con't.

no.	Ag (Ppm)	As (Ppm)	Au (Ppb)	Ba (Ppm)	Br (Ppm)	Cd (Ppm)	Ce (Ppm)	Co (Ppm)	Cr (Ppm)	Cs (Ppm)	Eu (Ppm)	Fe (Pct)	Hf (Ppm)	Ir (Ppb)	La (Ppm)	Lu (Ppm)	Mo (Ppm)	Na (Pct)	Ni (Ppm)	Rb (Ppm)	Sb (Ppm)	Sc (Ppm)	Se (Ppm)	Sm (Ppm)	Sn (Ppm)	Ta (Ppm)	Tb (Ppm)	Te (Ppm)	Th (Ppm)	U (Ppm)	W (Ppm)	Yb (Ppm)	Zn (Ppm)	Zr (Ppm)
DR180	* 5	4	* 5	520	* 1	* 10	100	26	110	8	* 2	6.2	6	* 100	53	0.8	* 2	0.67	* 20	210	1.2	13.0	* 10	8.5	* 200	2	1	* 20	12.0	3.3	4	5	310	* 500
DR181	* 5	3	* 5	* 100	2	25	54	24	96	3	* 2	>10.0	3	* 100	38	* 0.5	9	0.06	33	18	2.1	7.0	* 10	5.3	* 200	* 1	* 1	* 20	7.3	3.2	26	* 5	2900	* 500
DR182	20	3	* 5	* 100	* 1	69	39	13	160	* 1	* 2	1.5	3	* 100	27	* 0.5	92	* 0.05	* 20	40	0.9	4.6	* 10	3.8	* 200	* 1	* 1	* 20	5.8	2.9	12	* 5	9600	* 500
DR183	190	5	* 5	220	1	41	83	61	160	4	3	6.6	6	* 100	51	1.0	10	0.54	* 20	100	1.4	17.0	* 10	7.4	* 200	1	* 1	* 20	14.0	5.3	35	* 5	20500	* 500
DR184	* 5	14	* 5	* 100	* 1	* 10	58	* 10	170	* 1	* 2	>10.0	7	* 100	28	0.8	3	* 0.05	* 20	* 10	1.2	6.0	* 10	5.4	* 200	1	* 1	* 20	7.4	3.6	120	5	1100	* 500
DR185	* 5	30	7	* 100	* 1	* 10	15	21	73	5	* 2	>10.0	* 2	* 100	13	* 0.5	17	0.63	* 50	150	2.0	2.5	* 10	2.6	610	* 1	* 1	* 20	2.0	4.3	431	* 5	1500	* 500
DR186	* 5	* 1	* 5	820	* 1	* 10	96	16	190	22	* 2	4.7	4	* 100	52	0.9	25	0.61	35	530	0.4	19.0	* 10	8.3	* 200	1	1	* 20	14.0	3.3	17	6	320	* 500
DR187	* 5	25	10	* 100	* 1	11	10	* 10	54	5	* 2	>10.0	* 2	* 100	13	* 0.5	33	* 0.05	* 50	64	0.4	2.5	18	2.9	* 200	* 1	* 1	* 20	2.5	5.2	180	* 5	1700	* 500
DR188	* 5	4	* 5	* 100	3	12	32	56	100	2	* 2	>10.0	8	* 100	25	0.7	29	0.08	* 20	* 10	2.0	10.0	* 10	5.2	* 200	1	* 1	* 20	8.0	4.2	374	* 5	2100	* 500
DR189	* 5	6	* 5	850	2	* 10	50	19	110	21	* 2	6.2	3	* 100	27	* 0.5	4	0.53	* 20	230	2.0	12.0	* 10	5.1	* 200	* 1	* 1	* 20	3.5	1.2	30	* 5	1600	* 500
DR190	24	9	17	* 100	2	41	17	23	64	4	* 2	>10.0	* 2	* 100	14	* 0.5	14	0.22	* 50	38	1.7	4.5	* 10	2.5	250	* 1	* 1	* 20	3.9	5.4	304	* 5	10000	* 500
DR191	* 5	49	* 5	* 100	* 1	12	66	16	* 50	4	* 2	>10.0	10	* 100	27	* 0.5	9	* 0.05	* 20	40	2.8	6.1	* 10	5.6	* 200	* 1	* 1	* 20	7.7	5.4	170	6	3300	* 500
DR192	* 5	101	10	* 100	5	* 10	15	17	69	2	* 2	>10.0	4	* 100	17	* 0.5	14	0.19	* 20	67	14.0	3.5	* 10	2.9	< 390	* 1	* 1	* 20	2.9	6.2	615	* 5	4700	* 500
DR193	* 5	66	15	* 100	3	22	14	16	82	3	* 2	>10.0	* 2	* 100	13	* 0.5	5	* 0.05	* 20	15	3.4	2.8	* 10	2.3	< 500	* 1	* 1	* 20	1.7	3.0	314	* 5	5000	* 500
DR194	5	9	* 5	170	2	28	12	21	100	2	* 2	>10.0	* 2	* 100	12	* 0.5	5	* 0.05	* 20	* 10	2.0	3.2	* 10	2.0	* 200	* 1	* 1	* 20	2.0	2.5	160	* 5	3100	* 500
DR195	* 5	* 1	* 5	* 100	1	* 10	* 10	49	* 50	* 1	* 2	>10.0	* 2	* 100	8	* 0.5	12	0.15	* 20	* 10	1.3	1.4	* 10	1.2	* 200	* 1	* 1	* 20	1.0	1.9	78	* 5	1400	* 500
DR196	22	4	* 5	* 100	3	95	20	26	150	* 1	* 2	>10.0	3	* 100	16	* 0.5	35	0.06	* 20	* 10	0.9	3.6	* 10	2.3	* 200	* 1	* 1	* 20	3.5	2.7	557	* 5	20400	* 500
DR197	* 5	35	7	* 100	1	* 10	110	11	* 50	2	* 2	>10.0	9	* 100	63	0.7	22	0.06	* 20	* 10	2.7	7.0	* 10	6.2	* 200	2	* 1	* 20	24.0	11.0	100	8	1500	* 500
DR198	* 5	8	8	* 100	1	* 10	* 10	* 10	64	* 1	* 2	>10.0	* 2	* 100	7	* 0.5	2	* 0.05	* 20	* 10	0.5	1.9	* 10	2.0	* 200	* 1	* 1	* 20	1.6	1.9	150	* 5	390	* 500
DR199	* 5	2	* 5	* 100	3	* 10	23	43	* 50	17	* 2	>10.0	* 2	* 100	18	* 0.5	23	* 0.05	* 20	* 10	1.0	2.0	* 10	2.9	* 200	* 1	* 1	* 20	2.3	2.2	449	* 5	1300	* 500
DR200	34	28	27	* 100	* 1	340	10	48	120	7	* 2	>10.0	* 2	* 100	11	* 0.5	120	0.11	* 50	150	3.5	2.8	* 10	2.4	430	* 1	* 1	* 20	3.7	4.4	372	* 5	>20000	* 500
DR201	> 50	2	24	* 100	1	690	20	74	* 50	7	* 2	5.2	* 2	110	14	* 0.5	83	0.17	79	59	1.0	4.2	* 10	2.6	* 200	* 1	* 1	* 20	3.1	3.3	1020	* 5	>20000	* 500
DR202	* 5	15	9	* 100	1	400	73	23	67	* 1	* 2	10.0	6	* 100	41	0.8	140	* 0.05	* 20	* 10	7.7	7.8	* 10	5.9	* 200	2	* 1	* 20	19.0	7.0	110	* 5	27700	* 500
DR203	6	49	37	* 100	* 1	84	10	* 10	120	4	* 2	10.0	* 2	* 100	8	* 0.5	14	0.15	* 50	130	5.7	1.4	* 10	1.5	810	* 1	* 1	29	1.8	4.4	625	* 5	12000	* 500
DR204	* 5	18	9	160	* 1	24	20	* 10	160	31	* 2	3.7	* 2	* 100	11	* 0.5	4	0.44	* 50	710	3.1	2.9	* 10	2.1	330	* 1	* 1	* 20	3.7	2.5	263	* 5	2600	* 500
DR205	31	2	20	* 100	2	630	17	100	87	6	* 2	8.0	* 2	* 100	16	* 0.5	43	0.06	< 44	* 10	1.5	1.9	* 10	2.4	* 200	* 1	* 1	* 20	1.0	2.3	504	* 5	>30000	* 500
DR206	46	* 1	22	* 100	3	500	21	46	210	1	* 2	1.5	17	* 100	11	* 0.5	27	* 0.05	< 46	36	* 0.2	2.0	* 10	1.7	* 200	* 1	* 1	* 20	1.3	1.7	636	* 5	>20000	* 500
DR207	>100	6	53	* 100	7	860	30	290	83	6	* 2	8.6	7	* 100	24	* 0.5	42	0.09	70	92	2.8	3.8	* 10	4.1	* 200	* 1	* 1	* 20	5.3	5.2	99	* 5	>20000	* 500
DR208	38	2	< 13	* 100	* 1	1820	< 30	180	* 50	2	* 2	1.7	* 2	* 100	7	* 0.5	190	* 0.05	< 79	< 31	0.6	2.0	* 10	2.0	* 200	* 1	* 1	< 41	2.0	* 0.5	170	* 5	>30000	< 1100
DR209	> 50	4	19	180	* 1	110	17	13	110	3	* 2	1.7	* 2	* 100	10	* 0.5	200	0.06	* 50	37	1.6	2.3	12	2.3	* 200	* 1	* 1	* 20	3.5	3.7	150	* 5	18000	* 500
DR210	87	17	* 5	* 100	1	200	21	25	* 50	3	* 2	4.4	7	* 100	13	* 0.5	23	0.08	* 20	17	1.3	2.3	* 10	2.2	* 200	* 1	* 1	* 20	2.1	2.0	341	* 5	>30000	* 500
DR211	13	* 1	10	* 100	* 1	970	* 10	160	* 50	* 1	* 2	>10.0	* 2	* 100	13	* 0.5	6	* 0.05	< 52	* 10	0.8	4.5	* 10	1.7	* 200	* 1	* 1	* 20	2.9	3.0	110	* 5	>30000	* 500
DR212	* 5	7	* 5	* 100	* 1	* 10	* 10	* 10	92	* 1	* 2	>10.0	* 2	* 100	7	* 0.5	5	* 0.05	* 20	* 10	1.8	1.7	* 10	1.5	* 200	* 1	* 1	* 20	1.3	3.1	150	* 5	3500	* 500
DR213	6	121	* 5	* 100	2	37	12	60	* 50	* 1	* 2	>10.0	5	* 100	9	* 0.5	9	0.09	* 20	* 10	9.4	1.1	* 10	1.4	* 200	* 1	* 1	* 20	0.8	1.6	282	* 5	8300	* 500
DR214	140	9	49	* 100	5	870	56	140	* 50	9	* 2	6.8	5	* 100	32	* 0.5	70	0.15	< 44	100	3.4	6.7	* 10	5.0	* 200	* 1	* 1	* 20	11.0	7.1	29	5	>30000	* 500
DR215	42	5	57	* 100	* 1	550	24	95	* 50	4	* 2	7.3	* 2	* 100	16	* 0.5	23	0.06	* 50	* 10	3.8	2.5	* 10	3.1	* 200	* 1	* 1	* 20	2.0	4.5	9	* 5	>20000	* 500
DR216	38	12	19	* 100	2	390	17	53	63	4	* 2	9.5	* 2	* 100	17	* 0.5	38	0.16	* 50	19	1.8	3.5	* 10	3.2	* 200	* 1	* 1	* 20	5.4	4.0	238	* 5	>20000	* 500
DR217	16	31	30	* 100	* 1	360	22	56	150	2	* 2	10.0	* 2	* 100	15	* 0.5	16	* 0.05	* 50	15	2.6	3.0	* 10	2.8	270	* 1	* 1	* 20	3.6	5.2	170	* 5	>20000	* 500
DR218	* 5	11	6	230	* 1	* 10	45	* 10	230	16	* 2	4.6	4	* 100	28	0.5	9	0.47	* 20	290	4.2	11.0	* 10	3.7	* 200	* 1	* 1	* 20	9.0	3.0	100	* 5	1200	* 500
DR219	* 5	107	82	* 100	3	19	15	16	96	15	* 2	>10.0	* 2	* 100	14	* 0.5	6	0.21	23	350	17.0	3.1	* 10	1.7	< 400	* 1	* 1	* 20	2.2	5.1	586	* 5	5700	* 500
DR220	* 5	50	12	* 100	4	15	* 10	* 10	130	4	* 2	>10.0	3	* 100	12	* 0.5	4	0.26	* 20	130	8.6	2.8	* 10	1.8	< 380	* 1	* 1	* 20	2.5	5.1	541	* 5	2400	* 500
DR221	* 5	68	* 5	* 100	5	53	* 10	10	120	1	* 2	>10.0	4	* 100	7	* 0.5	13	* 0.05	* 20	* 10	10.0	2.1	* 10	1.2	< 370	3	* 1	* 20	1.4	4.8	705	* 5	9400	* 500
DR222	* 5	50	16	* 100	* 1	46	28	* 10	130	5	* 2	8.7	* 2	* 100	14	* 0.5	5	0.16	* 50	110	9.4	3.2	* 10	2.4	330	* 1	* 1	* 20	3.2	4.5	360	* 5	6300	* 500
DR223	* 5	14	* 5	110	2	11	* 10	82	* 50	3	* 2	>10.0	* 2	* 100	11	* 0.5	14	0.07	* 20	* 10	1.6	2.3	* 10	2.0	* 200	* 1	* 1	* 20	1.3	2.4	110	* 5	3800	* 500
DR224	* 5	6	* 5	* 100	* 1	* 10	* 10	66	* 50	* 1	* 2	>10.0	* 2	* 100	10	* 0.5	4	0.11	* 20	10	1.0	2.1	* 10	1.9	* 200	* 1	* 1	* 20	2.1	2.3	14	* 5	2200	* 500
DR225	* 5	438	32	* 100	4	60	68	59	72	10	2	>10.0	5	* 100	40	0.9	9	0.17	* 20	260	23.8	7.4	* 10	7.2	< 360	1	1	* 20	9.3	6.0	359	5	13000	* 500
DR226	29	5	* 5	* 100	3	* 10	120	40	54	* 1	* 2	10.0	4	* 100	68	1.1	130	0.07	* 20	* 10	3.4	6.7	* 10	10.0	* 200	* 1	2	* 20	10.0	3.7	6	7	>30000	* 500
DR227	* 5	5	6	1000	2	12	61	42	250	16	2	8.1	5	* 100	29	* 0.5	10	2.10	62	260	1.2	22.0	* 10	7.3	* 200	* 1	* 1	* 20	1.8	0.8	9	* 5	550	* 500
DR228	* 5	19	48	* 100	2	110	* 10	32	* 50	75	* 2	>10.0	* 2	* 100	* 5	* 0.5	7	0.19	* 20	1360	5.2	0.5	* 10	0.6	* 200	* 1	* 1	* 20	* 0.5	2.6	487	* 5	21900	* 500
DR229	6	3	* 5	* 100	* 1	16	59	17	130	1	2	>10.0	7	* 100	41	* 0.5	91	0.06	* 20	* 10	2.7	5.1	* 10	6.1	* 200	1	* 1	* 20	12.0	13.0	21	* 5	3100	540
DR230	* 5	3	25	* 100	2	* 10	100	* 10	170	3	* 2	10.0	12	* 100	58	* 0.5	89	0.12	* 20	18	2.2	11.0	* 10	8.0	* 200	2	1	* 20	15.0	19.0	7	6	250	700
DR231	* 5	4	9	* 100	2	47	43	23	* 50	* 1	* 2	8.2	16	* 100	22	0.7	1280	0.07	* 20	* 10	2.1	14.0	* 10	6.0	* 200	2	1	* 20	17.0	4.7	14	5	9000	750
DR232	15	10	11	240	* 1	100	33	22	62	23	* 2	3.6	3	* 100	13	* 0.5	22	0.30	* 50	350	2.3	7.0	* 10	3.1	* 200	* 1	* 1	* 20	3.3	3.5	39	* 5	16000	* 500

Appendix B. con't.

no.	Ag (Ppm)	As (Ppm)	Au (Ppb)	Ba (Ppm)	Br (Ppm)	Cd (Ppm)	Ce (Ppm)	Co (Ppm)	Cr (Ppm)	Cs (Ppm)	Eu (Ppm)	Fe (Pct)	Hf (Ppm)	Ir (Ppb)	La (Ppm)	Lu (Ppm)	Mo (Ppm)	Na (Pct)	Ni (Ppm)	Rb (Ppm)	Sb (Ppm)	Sc (Ppm)	Se (Ppm)	Sm (Ppm)	Sn (Ppm)	Ta (Ppm)	Tb (Ppm)	Te (Ppm)	Th (Ppm)	U (Ppm)	W (Ppm)	Yb (Ppm)	Zn (Ppm)	Zr (Ppm)
DR233	7	11	11	190	* 1	130	13	46	* 50	18	* 2	4.1	* 2	* 100	8	* 0.5	5	0.32	* 50	280	1.5	5.0	* 10	2.2	* 200	* 1	* 1	* 20	0.9	1.5	90	* 5	>20000	* 500
DR234	16	10	* 5	* 100	* 1	110	71	12	130	* 1	* 2	9.3	5	* 100	50	* 0.5	6	0.06	* 20	* 10	4.7	13.0	* 10	5.8	* 200	1	* 1	* 20	8.2	6.2	23	* 5	11000	* 500
DR235	> 50	13	* 5	* 100	2	130	30	67	130	3	* 2	3.2	* 2	* 100	21	* 0.5	487	0.06	* 50	* 10	3.3	6.3	* 10	4.3	* 200	* 1	* 1	* 20	4.8	8.1	360	* 5	>20000	* 500
DR236	54	5	* 5	* 100	* 1	110	43	22	80	* 1	2	10.0	4	* 100	27	* 0.5	51	0.05	* 20	* 10	3.7	10.0	* 10	4.7	* 200	* 1	* 1	* 20	6.6	6.9	53	* 5	19000	* 500
DR237	> 50	11	17	* 100	3	520	37	95	160	2	* 2	4.3	5	* 100	19	* 0.5	418	* 0.05	* 50	23	5.5	5.9	* 10	3.2	* 200	* 1	* 1	* 20	5.6	5.4	52	* 5	>20000	* 500
DR238	> 50	11	35	* 100	3	350	31	80	86	* 1	* 2	4.4	* 2	* 100	22	* 0.5	110	0.07	* 50	* 10	4.9	6.5	* 10	3.8	* 200	* 1	* 1	* 20	5.2	6.4	59	* 5	>20000	* 500
DR239	> 50	5	14	* 100	2	350	22	77	190	* 1	* 2	4.7	* 2	* 100	26	0.5	120	0.09	* 50	17	3.4	7.1	* 10	4.3	* 200	* 1	* 1	* 20	5.6	7.1	752	* 5	>20000	* 500
DR240	* 5	3	* 5	130	* 1	* 10	40	23	180	2	* 2	6.1	4	* 100	25	* 0.5	9	0.12	* 20	26	2.1	3.4	* 10	4.1	* 200	* 1	* 1	* 20	4.4	1.7	7	* 5	910	* 500
DR241	* 5	6	* 5	110	4	* 10	28	69	95	1	* 2	>10.0	* 2	* 100	23	* 0.5	5	0.28	58	17	1.8	5.4	* 10	3.0	* 200	* 1	* 1	* 20	2.7	1.9	28	* 5	1200	* 500
DR242	* 5	2	* 5	* 100	2	40	* 10	52	* 50	1	* 2	>10.0	* 2	* 100	* 5	* 0.5	* 2	0.10	* 20	* 10	0.9	0.8	* 10	0.7	* 200	* 1	* 1	* 20	0.6	1.2	24	* 5	6200	* 500
DR243	8	7	* 5	180	* 1	91	25	60	55	6	* 2	>10.0	* 2	* 100	21	* 0.5	14	0.09	* 20	* 10	2.8	5.1	* 10	3.1	* 200	* 1	* 1	* 20	2.5	1.4	25	* 5	16000	* 500
DR244	* 5	3	* 5	210	* 1	* 10	65	* 10	610	10	* 2	2.3	6	* 100	30	0.6	18	0.45	* 20	240	0.9	3.9	* 10	4.2	* 200	3	* 1	* 20	8.3	4.4	15	* 5	280	* 500
DR245	* 5	14	12	* 100	* 1	67	11	11	* 50	31	* 2	>10.0	* 2	* 100	8	* 0.5	67	0.12	* 20	710	1.7	10.0	* 10	2.4	< 500	* 1	* 1	* 20	22.0	14.0	239	* 5	29700	* 500
DR246	11	4	12	* 100	* 1	* 10	34	38	100	1	* 2	>10.0	4	* 100	22	* 0.5	4	* 0.05	* 20	12	0.9	8.3	* 10	3.7	* 200	* 1	* 1	* 20	5.2	7.0	110	* 5	420	* 500
DR247	* 5	6	* 5	670	* 1	* 10	88	12	280	6	2	3.8	5	* 100	43	* 0.5	11	2.60	* 20	230	3.0	11.0	* 10	6.4	* 200	2	1	* 20	10.0	6.1	10	* 5	* 200	* 500
DR248	* 5	4	16	* 100	* 1	* 10	54	39	120	* 1	* 2	>10.0	4	* 100	30	* 0.5	5	0.08	* 20	* 10	2.9	7.3	* 10	4.6	* 200	* 1	* 1	* 20	5.6	7.3	67	* 5	290	* 500
DR249	* 5	12	* 5	560	* 1	* 10	110	10	70	20	* 2	4.4	5	* 100	57	0.9	239	0.15	* 20	640	13.0	16.0	* 10	7.6	* 200	1	* 1	* 20	19.0	4.8	14	6	290	* 500
DR250	* 5	5	8	280	* 1	* 10	92	18	88	35	3	8.7	3	* 100	50	0.6	5	0.78	* 20	140	1.7	14.0	* 10	7.9	* 200	1	1	* 20	15.0	4.0	3	* 5	360	* 500
DR251	78	3	* 5	* 100	2	99	53	68	270	3	* 2	8.2	4	* 100	29	* 0.5	11	0.40	66	22	0.9	15.0	* 10	5.1	* 200	* 1	* 1	* 20	6.2	4.5	8	* 5	18000	* 500
DR252	6	2	* 5	* 100	* 1	* 10	27	60	62	14	* 2	>10.0	2	* 100	20	* 0.5	18	0.15	* 20	28	1.5	4.3	* 10	3.0	* 200	* 1	* 1	* 20	3.9	3.8	100	* 5	1000	* 500
DR253	* 5	4	7	* 100	* 1	* 10	28	46	88	9	* 2	>10.0	4	* 100	20	* 0.5	20	0.09	34	* 10	1.8	5.4	* 10	3.3	* 200	1	* 1	* 20	5.6	6.1	55	* 5	310	* 500
DR254	6	9	* 5	160	1	21	66	29	160	10	* 2	8.6	6	* 100	37	0.5	15	0.22	* 20	52	5.5	8.0	* 10	5.1	* 200	1	* 1	* 20	8.2	5.0	39	* 5	3800	750
DR255	* 5	13	* 5	1700	1	* 10	87	* 10	83	31	2	4.1	5	* 100	46	1.0	7	1.50	* 20	610	1.2	18.0	* 10	7.6	* 200	1	1	* 20	17.0	4.2	7	7	990	* 500
DR256	34	20	8	* 100	* 1	* 10	70	89	70	2	* 2	>10.0	6	* 100	41	* 0.5	21	* 0.05	45	* 10	1.0	4.4	* 10	7.3	* 200	* 1	1	* 20	7.9	8.0	96	* 5	4500	* 500
DR257	* 5	6	* 5	* 100	* 1	* 10	75	20	94	* 1	* 2	9.3	4	* 100	31	* 0.5	4	* 0.05	* 20	* 10	1.3	10.0	* 10	5.0	* 200	* 1	* 1	* 20	6.3	4.8	9	* 5	550	* 500
DR258	37	13	* 5	* 100	* 1	21	45	76	67	2	* 2	>10.0	8	* 100	29	* 0.5	7	0.14	* 20	62	0.9	6.7	* 10	5.3	* 200	1	* 1	* 20	9.1	8.4	100	* 5	3600	* 500
DR259	* 5	7	* 5	* 100	2	* 10	19	32	98	3	* 2	>10.0	6	* 100	11	* 0.5	6	* 0.05	* 20	* 10	0.5	5.0	* 10	4.0	* 200	* 1	* 1	* 20	6.1	2.6	47	* 5	370	* 500
DR260	* 5	* 1	* 5	230	* 1	* 10	15	39	180	2	* 2	7.1	* 2	* 100	7	* 0.5	* 2	2.90	78	110	1.9	46.0	* 10	2.6	* 200	* 1	* 1	* 20	1.3	* 0.5	14	* 5	250	* 500
DR261	* 5	2	* 5	110	* 1	* 10	15	33	270	2	* 2	7.2	* 2	* 100	8	0.5	3	3.00	61	140	1.3	43.0	* 10	2.7	* 200	* 1	* 1	* 20	1.9	1.0	4	* 5	390	* 500
DR262	23	5	* 5	* 100	* 1	250	100	70	210	3	* 2	8.9	9	* 100	48	* 0.5	10	0.07	* 20	80	2.0	9.4	* 10	7.2	* 200	1	1	* 20	12.0	11.0	6	* 5	>30000	* 500
DR263	9	7	* 5	* 100	* 1	120	48	76	330	3	* 2	>10.0	9	* 100	24	* 0.5	5	0.09	* 20	71	2.1	8.5	* 10	6.2	* 200	1	* 1	* 20	11.0	11.0	7	* 5	16000	* 500
DR264	8	4	* 5	850	* 1	21	45	14	180	5	* 2	5.1	6	* 100	22	* 0.5	5	0.17	* 20	270	1.8	11.0	* 10	5.1	* 200	1	* 1	* 20	8.8	8.5	23	* 5	4700	* 500
DR265	* 5	7	* 5	500	* 1	* 10	74	18	240	4	2	7.5	7	* 100	39	* 0.5	5	0.24	* 20	180	3.8	13.0	* 10	6.7	* 200	1	* 1	* 20	9.5	24.0	14	5	3200	580
DR266	* 5	11	* 5	750	* 1	* 10	200	49	190	48	* 2	>10.0	5	* 100	110	* 0.5	* 2	1.60	59	140	2.4	22.0	* 10	12.0	* 200	2	* 1	* 20	6.0	2.1	3	* 5	1500	* 500
DR267	* 5	5	* 5	540	* 1	13	80	16	110	12	* 2	3.7	5	* 100	31	* 0.5	* 2	0.80	* 20	290	1.2	10.0	* 10	5.2	* 200	1	* 1	* 20	5.7	4.4	9	* 5	4500	* 500
DR268	* 5	3	* 5	1100	* 1	* 10	54	19	160	7	* 2	3.3	7	* 100	31	* 0.5	6	1.00	* 20	300	1.8	8.3	* 10	5.7	* 200	1	* 1	* 20	8.7	3.4	6	* 5	2300	* 500
DR269	* 5	7	* 5	1500	* 1	* 10	63	10	* 50	11	* 2	1.9	4	* 100	27	* 0.5	5	1.90	* 20	680	1.0	12.0	* 10	4.7	* 200	2	1	* 20	10.0	7.4	7	5	750	* 500
DR270	* 5	4	* 5	280	* 1	* 10	42	78	150	53	* 2	10.0	* 2	* 100	17	* 0.5	6	0.82	77	660	2.4	42.0	* 10	4.5	* 200	* 1	* 1	* 20	3.0	15.0	12	7	1900	* 500
DR271	* 5	12	* 5	* 100	2	42	180	23	* 50	3	2	>10.0	10	* 100	68	1.0	190	0.11	* 20	26	4.6	20.0	* 10	12.0	* 200	3	2	* 20	20.0	7.1	8	11	15000	* 500
DR272	* 5	18	* 5	860	* 1	23	160	19	63	40	3	7.8	9	* 100	62	0.7	* 2	0.15	* 20	580	3.9	18.0	* 10	11.0	* 200	3	1	* 20	19.0	6.1	7	10	5700	* 500
DR273	19	7	* 5	* 100	* 1	28	140	180	72	3	* 2	>10.0	11	* 100	57	0.7	55	0.09	* 20	64	5.1	20.0	* 10	10.0	* 200	3	1	* 20	18.0	6.9	12	7	16000	* 500
DR274	13	41	7	* 100	2	11	120	290	* 50	2	3	>10.0	10	* 100	56	1.4	370	0.06	* 20	19	7.6	16.0	* 10	11.0	* 200	2	2	* 20	16.0	10.0	44	14	8200	820
DR275	41	8	9	160	2	230	42	56	240	3	* 2	>10.0	5	* 100	26	* 0.5	16	* 0.05	* 20	13	2.1	5.5	* 10	4.5	* 200	* 1	* 1	* 20	6.2	5.2	245	* 5	>30000	* 500
DR276	* 5	7	* 5	380	* 1	45	81	43	110	4	* 2	9.2	8	* 100	42	0.9	48	0.11	* 20	260	3.0	13.0	* 10	7.0	* 200	2	1	* 20	13.0	8.5	14	6	11000	* 500
DR277	* 5	5	* 5	320	* 1	20	81	32	91	6	* 2	9.5	8	* 100	44	0.8	83	0.14	* 20	250	2.6	15.0	* 10	7.3	* 200	2	* 1	* 20	13.0	8.1	18	6	4100	* 500
DR278	36	13	8	110	1	560	54	240	110	5	* 2	10.0	4	* 100	31	0.6	22	0.11	* 20	170	2.2	12.0	* 10	5.7	* 200	* 1	* 1	* 20	7.9	9.4	8	* 5	>30000	* 500
DR279	* 5	5	* 5	900	* 1	* 10	140	* 10	110	18	* 2	2.7	7	* 100	76	0.7	16	0.17	* 20	700	1.4	7.5	* 10	7.0	* 200	1	* 1	* 20	19.0	7.3	5	6	310	* 500
DR280	* 5	15	9	650	1	* 10	77	* 10	210	12	* 2	3.3	4	* 100	40	* 0.5	14	0.19	* 20	340	2.9	8.6	* 10	5.5	* 200	* 1	* 1	* 20	9.1	3.8	5	* 5	880	* 500
DR281	* 5	7	16	400	* 1	26	48	* 10	* 50	20	* 2	2.4	4	* 100	27	0.5	5	0.10	* 20	280	3.0	7.5	* 10	3.9	* 200	* 1	* 1	* 20	6.2	2.3	7	* 5	2700	* 500
DR282	20	5	* 5	* 100	* 1	250	37	79	* 50	5	* 2	5.6	3	* 100	16	* 0.5	17	0.11	* 50	100	1.3	4.8	* 10	4.0	* 200	* 1	* 1	* 20	5.1	6.1	5	* 5	>30000	* 500
DR283	48	10	* 5	440	* 1	24	65	36	* 50	8	* 2	5.7	6	* 100	29	* 0.5	20	0.15	* 50	200	1.7	6.5	* 10	6.1	* 200	1	* 1	* 20	9.5	4.8	13	* 5	4000	* 500
DR284	* 5	6	* 5	950	* 1	23	47	* 10	* 50	11	* 2	2.4	6	* 100	21	* 0.5	17	0.50	* 20	330	0.9	7.3	* 10	3.8	* 200	1	* 1	* 20	8.2	2.8	10	* 5	2900	* 500
DR285	* 5	10	* 5	1100	* 1	* 10	130	* 10	51	111	* 2	2.3	5	* 100	59	0.5	8	0.25	* 20	1150	2.0	10.0	* 10	7.2	* 200	3	* 1	* 20	27.0	9.2	7	7	240	520

Appendix B. con't.

no.	Ag (Ppm)	As (Ppm)	Au (Ppb)	Ba (Ppm)	Br (Ppm)	Cd (Ppm)	Ce (Ppm)	Co (Ppm)	Cr (Ppm)	Cs (Ppm)	Eu (Ppm)	Fe (Pct)	Hf (Ppm)	Ir (Ppb)	La (Ppm)	Lu (Ppm)
DR286	* 5	4	* 5	1400	* 1	* 10	190	* 10	* 50	60	* 2	2.2	9	* 100	83	0.7
DR287	* 5	12	* 5	530	* 1	* 10	35	* 10	* 50	9	* 2	2.8	3	* 100	17	* 0.5
DR288	* 5	5	7	1100	2	* 10	50	* 10	* 50	8	* 2	2.0	6	* 100	22	* 0.5
DR289	* 5	5	* 5	900	* 1	* 10	54	* 10	* 50	21	* 2	3.1	6	* 100	22	* 0.5
DR290	* 5	6	* 5	910	* 1	13	96	15	* 50	29	* 2	3.8	6	* 100	33	0.6
DR291	* 5	93	* 5	1100	2	* 10	110	* 10	140	89	2	3.4	6	* 100	45	0.7
DR292	* 5	17	* 5	860	* 1	* 10	95	* 10	* 50	82	* 2	3.3	4	* 100	39	* 0.5
DR293	52	32	* 5	* 100	1	67	34	35	* 50	25	* 2	8.0	4	* 100	18	* 0.5
DR294	100	17	14	* 100	* 1	410	* 10	100	* 50	49	* 2	>10.0	4	* 100	6	* 0.5
DR295	120	11	* 5	* 100	4	410	* 10	63	54	15	* 2	>10.0	13	* 100	13	* 0.5
DR296	19	7	* 5	* 100	* 1	13	48	43	* 50	12	* 2	>10.0	5	* 100	19	* 0.5
DR297	* 5	5	* 5	720	* 1	* 10	74	* 10	* 50	15	* 2	1.6	3	* 100	29	* 0.5
DR298	* 5	3	* 5	110	3	* 10	10	* 10	* 50	* 1	* 2	2.0	* 2	* 100	5	* 0.5
DR299	* 5	* 1	* 5	* 100	2	* 10	59	* 10	160	6	* 2	1.0	6	* 100	19	1.4
DR300	* 5	6	6	190	* 1	56	33	39	210	1	2	>10.0	17	* 100	21	1.0
DR301	72	7	* 5	* 100	2	200	27	23	67	6	* 2	3.1	* 2	* 100	16	* 0.5
DR302	* 5	17	* 5	320	* 1	* 10	16	* 10	* 50	3	* 2	0.5	* 2	* 100	9	* 0.5
DR303	* 5	6	* 5	910	* 1	* 10	40	* 10	190	5	* 2	0.5	2	* 100	17	* 0.5
DR304	> 50	3	* 5	310	1	260	45	23	200	2	* 2	1.3	3	* 100	26	* 0.5
DR305	110	7	* 5	* 100	4	120	57	20	98	6	* 2	4.4	6	* 100	24	* 0.5
DR306	* 5	4	* 5	1200	* 1	15	84	* 10	120	11	* 2	2.3	7	* 100	35	0.6
DR307	* 5	15	8	* 100	* 1	110	* 10	40	53	4	* 2	1.9	3	* 100	11	* 0.5
DR308	26	4	17	< 210	4	1910	45	560	74	< 2	* 2	4.1	* 2	< 150	11	* 0.5
DR309	> 50	3	51	180	* 1	160	10	56	110	1	* 2	5.4	* 2	* 100	12	* 0.5
DR310	32	8	34	* 100	2	810	21	270	71	2	* 2	4.4	9	* 100	10	* 0.5
DR311	* 5	4	* 5	2100	* 1	* 10	52	18	270	7	* 2	2.5	7	* 100	20	* 0.5
DR312	* 5	60	* 5	2000	1	* 10	59	29	100	10	* 2	3.8	6	* 100	25	* 0.5
DR313	* 5	12	* 5	>20000	1	* 10	89	* 10	64	7	* 2	3.2	10	* 100	36	* 0.5
DR314	* 5	34	< 10	>20000	* 1	25	36	18	250	5	2	4.0	8	* 100	20	* 0.5
DR315	* 5	54	7	1100	1	* 10	70	* 10	230	37	* 2	1.3	5	* 100	42	* 0.5
DR316	* 5	9	* 5	880	* 1	* 10	36	* 10	* 50	11	* 2	0.6	3	* 100	19	* 0.5
DR317	* 5	62	19	1200	* 1	* 10	14	* 10	290	9	* 2	1.7	* 2	* 100	6	* 0.5
DR318	* 5	* 1	* 5	650	* 1	* 10	87	* 10	* 50	100	2	2.8	* 2	* 100	43	0.9
DR319	* 5	5	6	810	* 1	* 10	34	20	110	12	3	5.7	3	* 100	21	* 0.5
DR320	32	7	38	320	* 1	410	43	140	65	7	* 2	7.0	3	* 100	24	* 0.5
DR321	25	5	* 5	860	* 1	61	48	24	160	11	* 2	2.5	2	* 100	20	* 0.5
DR322	30	14	9	1300	* 1	140	47	60	330	3	* 2	2.4	3	* 100	24	* 0.5
DR323	> 50	17	18	3800	* 1	670	39	170	110	4	* 2	4.3	4	* 100	21	* 0.5
DR324	* 5	5	* 5	610	1	* 10	47	* 10	220	16	* 2	3.9	5	* 100	26	0.5
DR325	7	25	7	670	7	16	48	15	110	14	* 2	>10.0	4	* 100	35	0.7
DR326	* 5	25	* 5	1900	* 1	* 10	27	14	180	5	* 2	>10.0	3	* 100	16	* 0.5
DR327	* 5	14	14	560	* 1	* 10	32	40	590	10	* 2	5.4	* 2	* 100	19	* 0.5
DR328	* 5	12	28	1400	* 1	* 10	44	48	610	5	* 2	7.2	3	* 100	23	* 0.5
DR329	10	12	7	230	* 1	200	27	16	99	8	* 2	0.7	3	* 100	15	* 0.5
DR330	* 5	14	* 5	380	* 1	94	11	* 10	53	4	* 2	0.6	* 2	* 100	9	* 0.5
DR331	22	16	* 5	650	* 1	290	120	48	190	9	3	1.9	4	* 100	68	1.1
DR332	* 5	16	* 5	360	* 1	* 10	60	* 10	260	11	* 2	0.8	6	* 100	30	* 0.5
DR333	> 50	11	8	150	2	880	58	74	130	3	* 2	2.4	* 2	* 100	23	0.5
DR334	* 5	10	9	300	* 1	17	70	* 10	240	7	* 2	1.2	5	* 100	29	* 0.5
DR335	38	49	320	* 100	10	27	10	* 10	62	* 1	* 2	0.5	* 2	* 100	* 5	* 0.5
DR336	> 50	81	502	* 100	11	48	10	* 10	130	* 1	* 2	0.8	* 2	* 100	* 5	* 0.5
DR337	11	219	877	* 100	2	24	* 10	* 10	530	1	* 2	2.9	* 2	* 100	* 5	* 0.5
DR338	* 5	1450	6560	230	4	* 10	10	* 10	240	6	* 2	9.4	* 2	* 100	5	* 0.5

no.	Mo (Ppm)	Na (Pct)	Ni (Ppm)	Rb (Ppm)	Sb (Ppm)	Sc (Ppm)	Se (Ppm)	Sm (Ppm)	Sn (Ppm)	Ta (Ppm)	Tb (Ppm)	Te (Ppm)	Th (Ppm)	U (Ppm)	W (Ppm)	Yb (Ppm)	Zn (Ppm)	Zr (Ppm)
DR286	10	0.22	* 20	1070	1.1	9.4	* 10	12.0	* 200	3	2	* 20	28.0	11.0	11	8	1200	* 500
DR287	47	0.09	* 20	270	2.7	7.3	* 10	3.5	* 200	* 1	* 1	* 20	4.7	3.5	16	* 5	950	* 500
DR288	200	0.13	* 20	360	0.7	5.7	* 10	3.6	* 200	1	* 1	* 20	10.0	2.9	9	* 5	450	* 500
DR289	12	0.18	* 20	500	1.0	10.0	* 10	4.2	* 200	* 1	* 1	* 20	8.3	5.6	12	* 5	420	* 500
DR290	15	0.24	* 20	580	1.3	13.0	* 10	6.7	* 200	2	* 1	* 20	16.0	8.8	12	7	820	* 500
DR291	3	0.18	* 20	1130	3.7	15.0	* 10	7.6	* 200	2	1	* 20	21.0	6.8	7	7	230	* 500
DR292	4	0.11	* 20	860	1.6	7.6	* 10	5.0	* 200	1	* 1	* 20	14.0	2.3	7	* 5	790	* 500
DR293	6	* 0.05	* 20	76	2.6	3.3	* 10	3.3	* 200	* 1	* 1	* 20	3.0	2.1	170	* 5	12000	* 500
DR294	9	0.06	* 20	* 10	3.7	0.6	* 10	0.8	* 200	* 1	* 1	* 20	* 0.5	0.7	525	* 5	>30000	* 500
DR295	86	* 0.05	* 20	* 10	12.0	1.1	* 10	2.2	* 200	* 1	* 1	* 20	0.6	3.3	950	* 5	>30000	* 500
DR296	8	* 0.05	* 20	15	1.8	4.5	* 10	3.4	* 200	* 1	* 1	* 20	4.5	1.8	13	* 5	1900	* 500
DR297	7	2.60	* 20	420	0.6	6.0	* 10	4.4	* 200	3	* 1	* 20	11.0	2.2	7	* 5	310	* 500
DR298	* 2	0.05	* 50	11	0.3	2.1	* 10	1.9	* 200	* 1	* 1	* 20	1.4	1.5	2	* 5	230	* 500
DR299	* 2	1.60	* 50	490	0.3	1.3	* 10	7.6	* 200	5	2	* 20	43.0	13.0	4	6	* 200	* 500
DR300	4	* 0.05	50	* 10	3.7	12.0	* 10	6.4	* 200	1	* 1	* 20	11.0	5.6	12	* 5	8200	640
DR301	7	0.14	* 50	34	1.1	3.4	* 10	3.1	* 200	* 1	* 1	* 20	5.2	2.6	517	* 5	>30000	* 500
DR302	4	0.05	* 20	45	1.7	2.0	* 10	1.3	* 200	* 1	* 1	* 20	1.5	1.3	6	* 5	* 200	* 500
DR303	3	0.10	* 50	75	0.9	2.6	* 10	2.7	* 200	* 1	* 1	* 20	4.8	1.7	6	* 5	390	* 500
DR304	6	* 0.05	* 50	90	0.9	5.3	* 10	3.5	* 200	* 1	* 1	* 20	5.0	2.7	5	* 5	>20000	* 500
DR305	130	* 0.05	32	180	1.9	7.9	* 10	3.7	* 200	* 1	* 1	* 20	7.1	8.9	11	* 5	24500	600
DR306	45	0.13	* 50	280	1.3	11.0	* 10	6.8	* 200	1	1	* 20	14.0	4.3	10	* 5	2900	* 500
DR307	6	0.26	* 20	66	1.6	4.4	* 10	2.1	* 200	* 1	* 1	* 20	1.8	0.8	120	* 5	19000	* 500
DR308	8	* 0.05	150	< 30	1.9	2.1	* 10	2.0	* 200	* 1	* 1	< 94	< 1.0	2.8	743	* 5	>30000	< 1400
DR309	16	0.12	64	28	1.6	5.8	14	2.5	* 200	* 1	* 1	* 20	2.2	1.5	458	* 5	19000	* 500
DR310	19	0.07	< 58	23	1.9	3.7	* 10	1.7	* 200	* 1	* 1	< 60	0.9	1.7	588	* 5	>30000	* 500
DR311	7	0.29	* 50	150	0.8	8.3	* 10	3.8	* 200	* 1	* 1	* 20	5.9	3.2	12	* 5	1100	* 500
DR312	8	0.48	88	200	2.0	13.0	* 10	4.4	* 200	* 1	* 1	* 20	5.8	2.5	10	* 5	1200	* 500
DR313	4	0.19	* 20	150	1.4	7.6	* 10	5.8	* 200	* 1	* 1	* 20	9.0	2.2	13	* 5	480	* 500
DR314	20	* 0.05	85	34	2.3	1.4	* 10	7.2	* 200	* 1	1	* 20	4.5	8.7	13	* 5	510	* 500
DR315	* 2	0.18	* 20	280	3.4	5.1	* 10	2.8	* 200	1	* 1	* 20	12.0	3.2	46	* 5	270	* 500
DR316	* 2	0.06	* 50	140	0.6	2.4	* 10	5.5	* 200	* 1	1	* 20	5.7	1.8	4	* 5	200	* 500
DR317	92	* 0.05	* 50	140	4.2	2.4	* 10	1.4	* 200	* 1	* 1	* 20	2.9	2.3	8	* 5	360	* 500
DR318	3	0.11	* 20	990	1.9	9.4	* 10	6.2	* 200	1	1	* 20	15.0	3.0	3	* 5	450	* 500
DR319	4	2.70	* 20	230	3.8	21.0	* 10	4.8	* 200	* 1	* 1	* 20	7.4	1.4	3	* 5	1100	540
DR320	18	2.20	* 20	180	1.7	14.0	* 10	4.9	* 200	* 1	* 1	* 20	2.9	1.4	* 2	* 5	>30000	* 500
DR321	7	1.10	* 50	230	1.1	6.5	* 10	4.1	* 200	1	* 1	* 20	8.5	2.1	5	* 5	9400	* 500
DR322	89	0.06	* 20	170	1.1	4.5	* 10	3.9	* 200	* 1	* 1	* 20	6.0	1.7	8	* 5	>30000	* 500
DR323	64	0.06	* 50	130	1.4	5.1	* 10	4.3	* 200	1	* 1	* 20	7.5	4.3	11	* 5	>20000	* 500
DR324	4	0.11	* 20	280	2.0	6.6	* 10	4.2	* 200	1	* 1	* 20	8.9	2.5	6	* 5	210	* 500
DR325	19	* 0.05	* 20	* 10	8.4	6.1	* 10	5.4	* 200	2	* 1	* 20	8.2	2.8	6	* 5	4600	* 500
DR326	13	0.58	* 50	120	2.0	4.0	* 10	3.0	* 200	1	* 1	* 20	8.0	1.8	6	* 5	2300	* 500
DR327	* 2	0.14	130	250	2.0	23.0	* 10	3.9	* 200	* 1	* 1	* 20	2.3	1.7	6	* 5	370	* 500
DR328	18	1.00	140	220	2.5	28.0	* 10	4.7	* 200	* 1	* 1	* 20	2.7	1.1	4	* 5	1700	560
DR329	4	0.05	* 50	86	1.6	3.7	* 10	3.8	* 200	* 1	* 1	* 20	4.4	2.9	3	* 5	>20000	* 500
DR330	3	* 0.05	* 50	33	1.1	1.9	* 10	2.0	* 200	* 1	* 1	* 20	2.5	1.5	3	* 5	7800	* 500
DR331	13	0.06	* 50	98	3.2	5.8	* 10	20.4	* 200	* 1	3	* 20	6.0	8.5	6	7	>20000	* 500
DR332	5	0.10	* 50	160	1.5	4.0	* 10	4.8	* 200	* 1	* 1	* 20	8.1	4.9	6	* 5	* 200	* 500
DR333	6	* 0.05	54	35	1.6	2.9	* 10	7.4	* 200	* 1	1	* 20	3.1	3.7	10	* 5	>20000	* 500
DR334	12	0.08	* 50	130	1.6	3.5	* 10	5.1	* 200	* 1	* 1	* 20	6.0	2.6	3	* 5	1500	* 500
DR335	9	* 0.05	* 50	* 10	14.0	* 0.5	* 10	0.6	* 200	* 1	* 1	* 20	* 0.5	2.3	2	* 5	1300	* 500
DR336	10	* 0.05	* 50	* 10	23.3	* 0.5	* 10	0.6	* 200	* 1	* 1	* 20	* 0.5	2.5	* 2	* 5	1900	* 500
DR337	15	* 0.05	* 20	20	16.0	0.5	* 10	0.8	* 200	* 1	* 1	* 20	* 0.5	4.8	5	* 5	3900	* 500
DR338	6	* 0.05	65	89	15.0	4.3	* 10	1.4	* 200	* 1	* 1	* 20	1.4	6.1	9	* 5	* 200	* 500

Appendix B. con't.

no.	Ag (Ppm)	As (Ppm)	Au (Ppb)	Ba (Ppm)	Br (Ppm)	Cd (Ppm)	Ce (Ppm)	Co (Ppm)	Cr (Ppm)	Cs (Ppm)	Eu (Ppm)	Fe (Pct)	Hf (Ppm)	Ir (Ppb)	La (Ppm)	Lu (Ppm)	Mo (Ppm)	Na (Pct)	Ni (Ppm)	Rb (Ppm)	Sb (Ppm)	Sc (Ppm)	Se (Ppm)	Sm (Ppm)	Sn (Ppm)	Ta (Ppm)	Tb (Ppm)	Te (Ppm)	Th (Ppm)	U (Ppm)	W (Ppm)	Yb (Ppm)	Zn (Ppm)	Zr (Ppm)
DR339	* 5	1010	3800	180	< 5	13	* 10	16	190	15	* 2	8.8	* 2	* 100	6	* 0.5	8	0.06	39	140	18.0	7.6	* 10	1.7	* 200	* 1	* 1	* 20	1.8	4.5	10	* 5	2900	* 500
DR340	* 5	653	2660	290	2	* 10	10	* 10	210	2	* 2	4.0	* 2	* 100	* 5	* 0.5	7	* 0.05	* 50	26	7.1	1.3	* 10	1.1	* 200	* 1	* 1	* 20	* 0.5	2.5	4	* 5	380	* 500
DR341	* 5	6	6	* 100	* 1	* 10	10	* 10	280	3	* 2	* 0.5	* 2	* 100	* 5	* 0.5	6	* 0.05	* 50	11	3.4	* 0.5	* 10	0.8	* 200	* 1	* 1	* 20	0.7	0.5	2	* 5	* 200	* 500
DR342	> 50	347	68	* 100	1	22	10	15	* 50	2	* 2	>10.0	* 2	* 100	* 5	* 0.5	445	* 0.05	* 50	* 10	18.0	1.0	79	* 0.2	* 200	* 1	* 1	* 20	* 0.5	21.0	72	* 5	1700	* 500
DR343	9	26	10	940	3	* 10	53	31	250	10	* 2	5.5	5	* 100	16	* 0.5	2	0.17	130	180	14.0	20.0	* 10	4.1	* 200	* 1	* 1	* 20	3.9	7.2	8	* 5	1400	* 500
DR344	> 50	21	260	280	30	55	31	15	* 50	6	* 2	2.8	* 2	* 100	10	* 0.5	11	0.44	54	48	124.0	8.7	* 10	2.3	* 200	* 1	* 1	* 20	2.1	1.9	6	* 5	1500	* 500
DR345	9	3	8	250	* 1	230	22	13	83	2	* 2	2.4	10	* 100	12	* 0.5	48	0.12	* 20	46	1.4	4.0	* 10	2.7	* 200	* 1	* 1	* 20	4.4	4.0	* 2	* 5	>30000	760
DR346	* 5	4	36	1200	* 1	30	52	23	200	11	* 2	4.2	3	* 100	27	* 0.5	4	2.80	50	290	3.2	19.0	* 10	5.1	* 200	* 1	* 1	* 20	2.6	0.9	4	* 5	5000	* 500
DR347	20	7	62	* 100	6	1500	86	110	130	* 1	3	5.0	10	* 100	49	* 0.5	7	0.06	< 49	* 10	1.7	4.4	* 10	7.0	* 200	* 1	* 1	* 20	6.3	4.7	10	* 5	>30000	* 500
DR348	79	65	779	* 100	7	1300	* 10'	11	270	* 1	* 2	4.2	* 2	* 100	* 5	* 0.5	27	0.05	< 43	* 10	146.0	1.0	* 10	0.3	* 200	* 1	* 1	* 20	* 0.5	5.6	227	* 5	>30000	* 500
DR349	* 5	3	* 5	540	* 1	* 10	66	* 10	96	21	* 2	2.8	3	* 100	28	* 0.5	* 2	0.43	* 50	260	2.7	12.0	* 10	5.0	* 200	* 1	* 1	* 20	12.0	3.1	4	* 5	650	* 500
DR350	* 5	13	76	1500	2	* 10	30	29	56	39	* 2	5.9	* 2	* 100	17	* 0.5	* 2	0.17	* 20	480	4.3	16.0	* 10	3.7	* 200	* 1	* 1	* 20	1.3	0.5	9	* 5	680	570
DR351	60	51	1950	* 100	7	88	* 10	* 10	100	1	* 2	2.3	* 2	* 100	* 5	* 0.5	11	0.07	* 20	18	54.3	1.0	* 10	0.7	* 200	* 1	* 1	* 20	* 0.5	1.1	7	* 5	8000	* 500
DR352	120	20	675	* 100	20	100	21	* 10	81	2	* 2	1.5	* 2	* 100	8	* 0.5	11	0.09	* 20	15	54.9	1.8	* 10	1.3	* 200	* 1	* 1	* 20	1.8	0.9	7	* 5	8400	* 500
DR353	* 5	2	* 5	120	* 1	* 10	* 10	* 10	* 50	* 1	* 2	* 0.5	* 2	* 100	* 5	* 0.5	5	* 0.05	* 20	* 10	0.2	* 0.5	* 10	0.4	* 200	* 1	* 1	* 20	* 0.5	0.9	4	* 5	230	* 500
DR354	* 5	32	160	710	* 1	* 10	21	* 10	360	8	* 2	1.2	2	* 100	13	* 0.5	2	0.07	* 50	97	2.4	3.5	* 10	2.2	* 200	* 1	* 1	* 20	3.6	2.4	6	* 5	* 200	* 500
DR355	94	2	7	* 100	* 1	250	24	44	* 50	4	* 2	9.0	4	* 100	7	* 0.5	14	* 0.05	* 20	* 10	0.8	0.6	* 10	2.2	* 200	* 1	* 1	* 20	1.5	1.1	84	* 5	>20000	* 500
DR356	74	3	17	* 100	* 1	110	20	21	91	2	* 2	6.1	* 2	* 100	7	* 0.5	35	* 0.05	* 20	* 10	1.6	* 0.5	* 10	3.1	* 200	* 1	* 1	* 20	0.7	2.3	33	* 5	16000	* 500
DR357	57	3	13	* 100	* 1	170	54	40	270	6	* 2	5.7	2	* 100	21	* 0.5	71	0.23	* 20	88	1.2	2.2	* 10	5.7	* 200	* 1	* 1	* 20	4.1	2.9	17	* 5	>20000	* 500
DR358	45	7	46	* 100	* 1	410	10	61	290	8	* 2	7.6	4	* 100	16	* 0.5	27	0.05	98	110	4.2	2.7	* 10	3.1	* 200	* 1	* 1	* 20	3.7	3.9	38	* 5	>20000	* 500
DR359	17	6	26	280	* 1	62	33	* 10	160	10	* 2	4.2	3	* 100	12	* 0.5	22	0.06	* 50	150	2.0	4.0	* 10	3.3	* 200	* 1	* 1	* 20	5.5	4.8	36	* 5	3800	* 500
DR360	57	4	10	* 100	2	420	20	51	230	10	* 2	>10.0	* 2	* 100	14	* 0.5	160	* 0.05	* 20	28	1.8	3.0	* 10	4.1	* 200	* 1	* 1	* 20	2.8	4.8	62	* 5	>30000	* 500
DR361	>100	8	9	* 100	* 1	390	10	58	64	6	* 2	>10.0	3	* 100	8	* 0.5	69	* 0.05	< 41	* 10	1.6	2.0	* 10	1.9	* 200	* 1	* 1	* 20	0.5	2.0	56	* 5	>20000	* 500
DR362	> 50	5	27	* 100	* 1	320	15	40	110	4	* 2	7.7	* 2	* 100	8	* 0.5	51	* 0.05	* 50	20	1.4	2.8	15	2.5	* 200	* 1	* 1	* 20	2.2	2.3	91	* 5	>20000	* 500
DR363	46	5	19	* 100	2	630	* 10	100	60	3	* 2	>10.0	* 2	* 100	7	* 0.5	58	* 0.05	* 20	* 10	1.5	1.0	* 10	3.5	* 200	* 1	* 1	* 20	0.6	2.0	130	* 5	>30000	* 500
DR364	* 5	12	13	710	* 1	* 10	61	11	60	26	* 2	4.8	4	* 100	32	0.7	7	0.15	* 50	470	1.6	14.0	* 10	8.4	* 200	2	2	* 20	19.0	6.7	5	* 5	210	* 500
DR365	* 5	10	10	280	* 1	* 10	25	22	460	3	* 2	1.5	4	* 100	16	* 0.5	15	* 0.05	* 20	91	1.1	2.3	* 10	2.2	* 200	* 1	* 1	* 20	3.8	6.0	2	* 5	220	* 500
DR366	* 5	3	5	460	* 1	* 10	59	* 10	250	5	* 2	0.8	3	* 100	14	* 0.5	5	0.05	* 50	190	0.8	2.3	* 10	2.3	* 200	* 1	* 1	* 20	5.2	2.2	7	* 5	430	* 500
DR367	* 5	19	8	490	* 1	* 10	76	* 10	140	28	* 2	4.0	5	* 100	28	0.6	20	0.19	* 50	320	1.2	15.0	* 10	6.2	* 200	2	1	* 20	17.0	6.4	4	* 5	240	* 500
DR368	* 5	9	23	1700	* 1	25	62	13	170	16	* 2	2.8	6	* 100	30	0.7	332	0.18	* 50	300	3.0	11.0	* 10	6.0	* 200	1	* 1	* 20	12.0	5.1	7	* 5	3800	* 500
DR369	* 5	4	* 5	360	1	* 10	37	* 10	200	6	* 2	0.9	6	* 100	17	0.7	4	1.20	* 20	530	0.9	2.7	* 10	2.5	* 200	4	* 1	* 20	46.0	5.6	2	* 5	280	* 500
DR370	* 5	22	11	1000	* 1	* 10	64	14	180	18	* 2	4.2	5	* 100	39	0.7	6	0.11	* 20	240	1.9	13.0	* 10	6.5	* 200	* 1	* 1	* 20	13.0	4.1	5	* 5	4000	* 500
DR371	* 5	43	10	680	1	* 10	61	10	240	11	* 2	3.6	6	* 100	27	* 0.5	13	0.09	* 20	190	2.3	10.0	* 10	4.4	* 200	1	* 1	* 20	12.0	3.6	6	* 5	2200	* 500
DR372	> 50	68	58	130	4	12	10	120	180	* 1	* 2	2.4	* 2	* 100	* 5	* 0.5	9	* 0.05	* 50	* 10	26.0	0.6	* 10	0.8	* 200	* 1	* 1	* 20	0.8	1.4	* 2	* 5	2600	* 500
DR373	7	32	* 5	1100	* 1	* 10	100	* 10	280	6	3	3.5	5	* 100	46	0.6	3	0.08	* 20	140	2.0	10.0	* 10	16.0	* 200	1	2	* 20	9.3	6.7	8	* 5	1100	* 500
DR374	> 50	61	160	* 100	1	16	25	67	220	2	* 2	>10.0	* 2	* 100	15	* 0.5	22	* 0.05	* 50	13	17.0	5.4	* 10	3.0	* 200	* 1	* 1	* 20	3.5	4.6	50	* 5	10000	* 500
DR375	> 50	40	94	* 100	* 1	40	10	48	110	3	* 2	>10.0	* 2	* 100	10	* 0.5	7	0.09	* 50	* 10	7.8	4.8	* 10	2.0	* 200	* 1	* 1	* 20	3.4	5.2	52	* 5	6100	* 500
DR376	110	32	190	* 100	1	130	* 10	79	170	5	* 2	>10.0	* 2	* 100	7	* 0.5	16	* 0.05	* 20	* 10	7.8	1.0	* 10	1.5	* 200	* 1	* 1	* 20	* 0.5	10.0	66	* 5	>30000	* 500
DR377	13	28	39	110	* 1	16	19	25	87	2	* 2	3.7	* 2	* 100	15	* 0.5	7	0.17	* 20	47	6.6	2.8	* 10	2.6	* 200	* 1	* 1	* 20	5.4	2.7	11	* 5	4800	* 500
DR378	33	32	69	* 100	2	14	* 10	32	200	2	* 2	>10.0	* 2	* 100	* 5	* 0.5	10	* 0.05	* 20	* 10	10.0	1.6	* 10	0.8	* 200	* 1	* 1	* 20	* 0.5	4.2	170	* 5	3300	* 500
DR379	> 50	30	220	* 100	1	64	10	38	66	4	* 2	>10.0	* 2	* 100	8	* 0.5	10	0.13	* 50	22	8.8	1.9	* 10	1.4	* 200	* 1	* 1	* 20	3.6	6.7	85	* 5	16000	* 500
DR380	74	19	100	* 100	3	120	* 10	26	230	2	* 2	>10.0	* 2	* 100	* 5	* 0.5	6	* 0.05	* 20	* 10	23.8	1.2	* 10	0.8	* 200	* 1	* 1	* 20	* 0.5	3.1	140	* 5	17000	* 500
DR381	> 50	23	430	* 100	* 1	32	15	68	83	8	* 2	>10.0	* 2	* 100	18	* 0.5	* 2	* 0.05	* 50	* 10	5.1	8.7	18	2.8	* 200	* 1	* 1	* 20	4.3	12.0	86	* 5	12000	* 500
DR382	22	13	30	* 100	* 1	40	34	32	200	4	* 2	>10.0	4	* 100	29	* 0.5	* 2	* 0.05	* 50	* 10	3.6	6.2	* 10	5.2	* 200	* 1	* 1	* 20	10.0	4.5	39	* 5	3900	* 500
DR383	16	20	58	* 100	* 1	19	18	39	99	6	* 2	>10.0	3	* 100	12	* 0.5	* 2	0.06	* 50	* 10	3.9	4.4	* 10	2.3	* 200	* 1	* 1	* 20	4.1	6.0	72	* 5	4200	* 500
DR384	18	15	45	280	* 1	140	77	50	51	2	* 2	>10.0	9	* 100	32	1.2	8	* 0.05	* 20	* 10	1.7	10.0	* 10	6.5	* 200	2	* 1	* 20	12.0	7.6	21	8	21100	* 500
DR385	>300	21	2770	* 100	* 1	290	< 24	92	* 50	* 1	* 2	>10.0	* 2	* 100	* 5	* 0.5	12	* 0.05	< 60	< 30	6.8	* 0.5	110	0.2	* 200	* 1	* 1	< 50	* 0.5	5.0	375	* 5	>30000	* 500
DR386	170	12	94	* 100	* 1	220	16	63	380	* 1	* 2	6.8	* 2	* 100	13	* 0.5	* 2	* 0.05	* 20	* 10	6.7	2.4	13	2.8	* 200	* 1	* 1	* 20	1.3	3.0	28	* 5	>30000	* 500
DR387	* 5	2	* 5	* 100	* 1	* 10	49	* 10	* 50	3	* 2	1.2	7	* 100	20	1.1	3	2.80	* 20	87	1.1	2.8	* 10	2.7	* 200	4	* 1	* 20	42.0	7.7	* 2	7	2400	* 500
DR388	* 5	* 1	17	* 100	* 1	* 10	* 10	* 10	* 50	* 1	* 2	* 0.5	* 2	* 100	* 5	* 0.5	* 2	* 0.05	* 20	* 10	0.4	* 0.5	* 10	0.6	* 200	* 1	* 1	* 20	* 0.5	1.0	* 2	* 5	660	* 500
DR389	29	16	64	* 100	* 1	19	* 10	15	* 50	14	* 2	>10.0	* 2	* 100	14	* 0.5	* 2	0.07	* 20	* 10	3.0	4.9	* 10	2.2	* 200	* 1	* 1	* 20	2.9	5.1	110	* 5	3700	* 500
DR390	140	6	280	* 100	* 1	140	* 10	43	160	1	* 2	>10.0	* 2	* 100	* 5	* 0.5	* 2	* 0.05	41	* 10	6.2	0.8	* 10	0.6	* 200	* 1	* 1	* 20	* 0.5	2.8	100	* 5	19000	* 500
DR391	* 5	3	* 5	310	* 1	* 10	98	19	330	14	* 2	5.6	3	* 100	41	0.6	* 2	* 0.05	* 20	220	1.6	4.8	* 10	5.9	* 200	1	* 1	* 20	13.0	4.6	11	* 5	690	* 500

Appendix B. con't.

no.	Ag (Ppm)	As (Ppm)	Au (Ppb)	Ba (Ppm)	Br (Ppm)	Cd (Ppm)	Ce (Ppm)	Co (Ppm)	Cr (Ppm)	Cs (Ppm)	Eu (Ppm)	Fe (Pct)	Hf (Ppm)	Ir (Ppb)	La (Ppm)	Lu (Ppm)	Mo (Ppm)	Na (Pct)	Ni (Ppm)	Rb (Ppm)	Sb (Ppm)	Sc (Ppm)	Se (Ppm)	Sm (Ppm)	Sn (Ppm)	Ta (Ppm)	Tb (Ppm)	Te (Ppm)	Th (Ppm)	U (Ppm)	W (Ppm)	Yb (Ppm)	Zn (Ppm)	Zr (Ppm)
DR392	* 5	5	* 5	* 100	* 1	12	38	25	* 50	5	* 2	>10.0	3	* 100	19	* 0.5	3	0.06	* 20	* 10	3.2	12.0	* 10	3.9	* 200	* 1	* 1	* 20	5.1	7.6	14	* 5	1900	* 500
DR393	* 5	6	34	730	* 1	* 10	30	16	* 50	3	* 2	7.8	* 2	* 100	16	* 0.5	9	* 0.05	* 20	30	2.3	6.4	* 10	2.8	* 200	* 1	* 1	* 20	2.4	4.4	12	* 5	1500	* 500
DR394	14	8	27	* 100	* 1	16	* 10	21	89	5	* 2	>10.0	* 2	* 100	8	* 0.5	3	* 0.05	* 20	* 10	3.9	1.8	* 10	0.9	* 200	* 1	* 1	* 20	0.9	5.1	52	* 5	3100	* 500
DR395	22	10	72	* 100	* 1	15	* 10	17	79	2	* 2	>10.0	* 2	* 100	* 5	* 0.5	* 2	* 0.05	* 20	* 10	4.1	* 0.5	* 10	0.5	* 200	* 1	* 1	* 20	0.5	2.4	56	* 5	1700	* 500
DR396	34	12	85	* 100	* 1	21	* 10	27	130	* 1	* 2	>10.0	* 2	* 100	* 5	* 0.5	5	* 0.05	* 20	* 10	3.1	0.6	* 10	0.3	* 200	* 1	* 1	* 20	* 0.5	4.0	92	* 5	3700	* 500
DR397	* 5	12	6	* 100	* 1	15	* 10	28	* 50	2	* 2	>10.0	* 2	* 100	12	* 0.5	6	* 0.05	24	* 10	2.7	2.9	* 10	1.5	* 200	* 1	* 1	* 20	1.8	10.0	27	* 5	3300	* 500
DR398	200	6	110	* 100	* 1	44	110	30	* 50	5	* 2	>10.0	3	* 100	130	* 0.5	37	* 0.05	* 20	* 10	8.3	25.0	* 10	12.0	* 200	1	* 1	* 20	5.5	15.0	10	* 5	9000	* 500
DR399	31	22	55	* 100	* 1	15	* 10	45	* 50	3	* 2	>10.0	* 2	* 100	5	* 0.5	14	* 0.05	* 20	* 10	3.0	1.9	* 10	1.1	* 200	* 1	* 1	* 20	1.1	2.6	180	* 5	3100	750
DR400	* 5	5	33	* 100	* 1	11	* 10	27	99	2	* 2	>10.0	* 2	* 100	10	* 0.5	* 2	* 0.05	23	* 10	3.7	2.4	* 10	1.2	* 200	* 1	* 1	* 20	1.3	4.2	26	* 5	3100	* 500
DR401	8	4	* 5	* 100	* 1	31	* 10	33	95	1	* 2	>10.0	* 2	* 100	8	* 0.5	* 2	* 0.05	* 20	* 10	2.6	1.5	* 10	0.8	* 200	* 1	* 1	* 20	0.6	4.6	27	* 5	5500	* 500
DR402	16	13	79	* 100	* 1	22	* 10	14	67	2	* 2	>10.0	* 2	* 100	* 5	* 0.5	* 2	* 0.05	* 20	* 10	5.9	0.7	* 10	0.4	* 200	* 1	* 1	* 20	* 0.5	3.8	120	* 5	3900	* 500
DR403	* 5	9	470	200	* 1	17	66	30	96	6	* 2	>10.0	4	* 100	28	0.7	* 2	* 0.05	* 20	52	3.5	7.3	* 10	5.8	* 200	1	* 1	* 20	8.2	4.7	35	* 5	2200	* 500
DR404	> 50	36	180	420	* 1	47	29	47	140	7	* 2	>10.0	4	* 100	15	* 0.5	8	0.16	* 50	64	4.5	5.4	* 10	3.2	* 200	* 1	* 1	* 20	7.7	8.6	58	* 5	10000	* 500
DR405	* 5	6	6	880	* 1	* 10	34	11	100	14	* 2	10.0	4	* 100	15	0.6	7	0.11	* 50	200	1.0	27.0	* 10	5.1	* 200	* 1	1	* 20	7.2	3.0	8	* 5	950	* 500
DR406	6	10	84	620	1	* 10	98	16	150	17	* 2	3.6	9	* 100	35	0.8	* 2	0.09	* 20	200	6.6	11.0	* 10	5.0	* 200	* 1	* 1	* 20	11.0	3.2	10	5	1300	* 500
DR407	9	8	34	640	1	37	85	13	270	12	* 2	3.2	7	* 100	36	0.6	* 2	0.09	39	170	10.0	9.5	* 10	5.7	* 200	* 1	1	* 20	9.5	2.8	17	6	12000	* 500
DR408	9	11	16	490	2	* 10	70	13	240	9	* 2	3.5	5	* 100	31	0.6	6	0.08	* 20	120	5.9	7.5	* 10	4.8	* 200	* 1	* 1	* 20	8.0	3.3	11	* 5	1900	* 500
DR409	* 5	22	* 5	760	3	* 10	21	25	* 50	18	* 2	5.1	< 2	* 100	10	* 0.5	* 2	0.09	* 20	220	15.0	14.0	* 10	2.3	* 200	* 1	* 1	* 20	1.4	7.7	18	* 5	3200	* 500
DR410	* 5	13	* 5	1200	6	11	110	17	190	23	* 2	3.6	5	* 100	45	1.0	* 2	0.15	* 20	260	6.0	13.0	* 10	7.8	* 200	* 1	1	* 20	11.0	3.3	15	6	2000	* 500
DR411	* 5	12	997	450	* 1	* 10	42	* 10	100	4	* 2	3.5	3	* 100	20	* 0.5	4	* 0.05	* 20	87	2.8	4.6	* 10	3.7	* 200	* 1	* 1	* 20	4.9	3.0	76	* 5	1300	* 500
DR412	19	16	38	* 100	* 1	16	< 10	13	* 50	3	* 2	>10.0	* 2	* 100	* 5	* 0.5	17	0.37	* 20	49	6.5	0.9	* 10	0.7	* 200	* 1	* 1	* 20	5.5	7.5	89	* 5	3800	* 500
DR413	* 5	6	42	510	* 1	38	54	17	130	6	* 2	4.8	3	* 100	20	* 0.5	* 2	0.05	* 20	94	2.9	5.3	* 10	3.8	* 200	* 1	* 1	* 20	5.3	3.8	18	* 5	9200	* 500
DR414	* 5	2	* 5	* 100	4	* 10	63	* 10	240	4	* 2	1.4	7	* 100	21	1.1	9	3.30	* 20	420	1.6	2.9	* 10	3.0	* 200	4	* 1	* 20	48.0	12.0	5	7	* 200	* 500
DR415	* 5	9	* 5	520	* 1	* 10	66	11	290	9	* 2	2.3	5	* 100	22	* 0.5	5	0.06	* 20	130	2.4	5.4	* 10	4.2	* 200	* 1	* 1	* 20	6.1	2.9	6	* 5	960	* 500
DR416	10	23	21	* 100	* 1	16	10	37	190	6	* 2	>10.0	* 2	* 100	12	* 0.5	6	0.05	71	22	2.1	6.4	* 10	1.8	* 200	* 1	* 1	* 20	2.4	7.6	53	* 5	4200	* 500
DR417	48	8	92	* 100	* 1	11	10	24	* 50	1	* 2	>10.0	3	* 100	* 5	* 0.5	* 2	* 0.05	30	* 10	2.8	* 0.5	* 10	0.6	* 200	* 1	* 1	* 20	* 0.5	2.8	46	* 5	3300	* 500
DR418	14	39	42	* 100	* 1	* 10	10	25	* 50	2	* 2	>10.0	* 2	* 100	* 5	* 0.5	4	* 0.05	41	21	2.2	* 0.5	* 10	0.3	* 200	* 1	* 1	* 20	* 0.5	1.6	84	* 5	590	* 500
DR419	14	21	25	* 100	* 1	10	* 10	13	56	2	* 2	>10.0	* 2	* 100	8	* 0.5	7	* 0.05	* 20	* 10	4.4	1.5	* 10	1.2	* 200	* 1	* 1	* 20	1.4	4.5	53	* 5	1300	* 500
DR420	37	4	20	* 100	* 1	23	* 10	36	210	3	* 2	>10.0	* 2	* 100	* 5	* 0.5	* 2	* 0.05	21	17	4.2	1.5	* 10	0.7	* 200	* 1	* 1	* 20	* 0.5	1.2	49	* 5	2600	* 500
DR421	* 5	10	* 5	* 100	* 1	11	* 10	14	* 50	* 1	* 2	>10.0	* 2	* 100	* 5	* 0.5	7	* 0.05	* 20	* 10	3.3	0.8	* 10	1.1	* 200	* 1	* 1	* 20	* 0.5	3.1	41	* 5	980	* 500
DR422	* 5	2	6	210	* 1	* 10	46	* 10	160	16	* 2	1.2	6	* 100	18	1.1	14	2.80	* 20	400	1.1	3.2	* 10	2.5	* 200	4	* 1	* 20	46.0	13.0	* 2	7	* 200	* 500
DR423	* 5	12	44	110	* 1	* 10	* 10	39	100	4	* 2	>10.0	* 2	* 100	8	* 0.5	* 2	0.06	42	* 10	4.2	7.6	* 10	2.0	* 200	* 1	* 1	* 20	1.6	2.6	160	* 5	1500	* 500
DR424	8	28	10	* 100	* 1	* 10	10	110	64	* 1	* 2	>10.0	3	* 100	* 5	* 0.5	* 2	0.09	* 20	21	2.1	0.9	* 10	0.8	* 200	* 1	* 1	* 20	* 0.5	1.1	49	* 5	640	* 500
DR425	* 5	20	11	110	* 1	* 10	10	66	130	* 1	* 2	>10.0	5	* 100	* 5	* 0.5	5	* 0.05	* 20	23	2.3	* 0.5	* 10	0.2	* 200	* 1	* 1	* 20	* 0.5	0.9	190	* 5	390	* 500
DR426	14	12	160	* 100	* 1	21	10	17	70	7	* 2	>10.0	5	* 100	15	* 0.5	* 2	0.07	* 20	* 10	14.0	2.9	* 10	1.9	* 200	* 1	* 1	* 20	2.8	6.7	95	* 5	2900	* 500
DR427	* 5	46	9	600	* 1	* 10	58	23	110	12	* 2	9.0	3	* 100	28	* 0.5	5	0.11	* 20	230	3.5	11.0	* 10	3.8	* 200	* 1	* 1	* 20	7.0	7.5	30	* 5	2600	* 500
DR428	* 5	9	18	130	* 1	* 10	16	29	99	4	* 2	>10.0	* 2	* 100	10	* 0.5	4	* 0.05	* 20	17	2.9	5.7	* 10	1.9	* 200	* 1	* 1	* 20	1.7	3.8	67	* 5	2100	* 500
DR429	* 5	5	25	830	* 1	10	57	43	180	13	* 2	7.6	5	* 100	24	* 0.5	4	0.14	* 20	390	1.8	14.0	* 10	4.1	* 200	* 1	* 1	* 20	4.2	19.0	12	* 5	1500	* 500
DR430	6	11	18	2100	* 1	* 10	48	54	110	13	* 2	8.5	2	* 100	27	* 0.5	* 2	0.17	* 20	330	1.8	16.0	* 10	3.7	* 200	* 1	* 1	* 20	4.3	16.0	18	* 5	1800	* 500
DR431	* 5	5	13	960	* 1	14	58	19	130	13	* 2	5.5	5	* 100	29	* 0.5	5	0.13	* 20	330	1.7	13.0	* 10	4.7	* 200	* 1	* 1	* 20	5.8	7.0	4	* 5	2100	670
DR432	* 5	10	* 5	900	* 1	* 10	82	46	120	15	* 2	9.1	5	* 100	33	* 0.5	4	0.07	* 20	220	2.1	14.0	* 10	5.7	* 200	* 1	* 1	* 20	9.2	13.0	10	* 5	1400	* 500
DR433	8	11	12	* 100	* 1	15	20	140	* 50	13	* 2	>10.0	7	* 100	17	* 0.5	* 2	* 0.05	* 20	74	3.6	5.2	* 10	3.5	* 200	1	1	* 20	6.9	3.0	140	* 5	840	* 500
DR434	> 50	24	150	330	* 1	97	21	57	120	10	* 2	>10.0	2	* 100	16	* 0.5	7	0.08	* 50	64	11.0	4.5	* 10	2.8	* 200	* 1	* 1	* 20	5.1	5.5	48	* 5	19000	* 500
DR435	> 50	12	130	* 100	* 1	92	10	32	140	3	* 2	>10.0	* 2	* 100	* 5	* 0.5	3	* 0.05	50	* 10	3.8	1.0	* 10	0.7	* 200	* 1	* 1	* 20	* 0.5	1.3	71	* 5	9000	* 500
DR436	40	15	38	* 100	* 1	* 10	10	95	* 50	5	* 2	>10.0	* 2	* 100	10	* 0.5	10	0.05	* 50	* 10	5.2	3.2	* 10	1.9	* 200	* 1	* 1	* 20	3.1	7.1	160	* 5	>20000	* 500
DR437	5	6	28	280	6	* 10	36	* 10	80	2	* 2	1.6	2	* 100	13	* 0.5	3	0.06	* 50	* 10	1.1	4.4	* 10	2.5	* 200	* 1	* 1	* 20	6.2	2.8	5	* 5	1200	* 500
DR438	> 50	25	450	* 100	2	160	10	64	110	3	* 2	>10.0	* 2	* 100	9	* 0.5	16	* 0.05	* 50	* 10	7.4	2.6	* 10	1.6	* 200	* 1	* 1	* 20	1.7	6.5	110	* 5	>20000	* 500
DR439	50	14	24	130	* 1	* 10	10	79	* 50	4	* 2	>10.0	* 2	* 100	10	* 0.5	15	* 0.05	* 50	* 10	5.3	3.1	* 10	2.3	* 200	* 1	* 1	* 20	2.8	7.8	160	* 5	>20000	* 500
DR440	24	14	22	* 100	* 1	* 10	10	69	94	3	* 2	>10.0	* 2	* 100	11	* 0.5	15	* 0.05	* 50	* 10	4.9	3.3	* 10	2.3	* 200	* 1	* 1	* 20	3.0	8.5	150	* 5	>20000	* 500
DR441	8	3	* 5	440	* 1	* 10	57	* 10	160	3	* 2	1.0	6	* 100	18	1.0	* 2	0.28	* 50	560	0.8	1.5	* 10	5.4	* 200	5	1	* 20	34.0	8.5	5	* 5	1300	* 500
DR442	13	5	45	130	1	* 10	17	* 10	280	5	* 2	1.0	* 2	* 100	9	* 0.5	4	* 0.05	* 50	66	10.0	3.0	* 10	1.9	* 200	* 1	* 1	* 20	2.8	0.8	4	* 5	1100	* 500
DR443	* 5	6	* 5	120	* 1	* 10	24	* 10	230	6	* 2	1.3	* 2	* 100	9	* 0.5	3	* 0.05	* 50	66	2.0	3.3	* 10	2.1	* 200	* 1	* 1	* 20	3.5	1.2	2	* 5	* 200	* 500
DR444	> 50	42	632	< 200	91	290	31	* 10	< 120	* 1	* 2	0.8	* 2	* 100	* 5	* 0.5	5	* 0.05	* 50	28	482.0	* 0.5	< 20	1.1	< 680	* 1	* 1	< 68	< 1.7	< 1.1	< 4	11	17000	* 500

Appendix B. con't.

no.	Ag (Ppm)	As (Ppm)	Au (Ppb)	Ba (Ppm)	Br (Ppm)	Cd (Ppm)	Ce (Ppm)	Co (Ppm)	Cr (Ppm)	Cs (Ppm)	Eu (Ppm)	Fe (Pct)	Hf (Ppm)	Ir (Ppb)	La (Ppm)	Lu (Ppm)
DR445	* 5	1	19	* 100	* 1	14	12	* 10	* 50	3	* 2	0.7	* 2	* 100	6	* 0.5
DR446	* 5	3	12	* 100	* 1	15	14	* 10	* 50	2	* 2	1.1	* 2	* 100	7	* 0.5
DR447	> 50	25	3720	* 100	9	370	22	20	* 50	* 1	* 2	2.7	* 2	* 100	* 5	* 0.5
DR448	10	10	140	120	1	49	10	* 10	* 50	* 1	* 2	0.8	* 2	* 100	* 5	* 0.5
DR449	* 5	2	* 5	430	* 1	* 10	47	12	94	12	* 2	2.1	4	* 100	23	* 0.5
DR450	* 5	42	* 5	390	1	* 10	84	11	68	11	* 2	3.3	4	* 100	36	* 0.5
DR451	* 5	4	* 5	280	* 1	* 10	31	20	* 50	7	* 2	1.8	5	* 100	12	* 0.5
DR452	* 5	15	* 5	450	* 1	* 10	85	14	110	20	2	3.7	4	* 100	37	* 0.5
DR453	* 5	2	5	590	* 1	* 10	62	10	93	14	* 2	2.3	5	* 100	24	* 0.5
DR454	* 5	6	8	350	* 1	* 10	53	11	53	8	* 2	2.7	7	* 100	22	* 0.5
DR455	* 5	68	5	780	4	* 10	58	13	63	5	* 2	3.3	8	* 100	28	* 0.5
DR456	6	2	* 5	200	* 1	280	31	* 10	120	2	* 2	2.5	4	* 100	15	* 0.5
DR457	45	6	* 5	180	* 1	360	37	16	130	3	* 2	1.7	7	* 100	14	* 0.5
DR458	34	2	* 5	750	* 1	31	49	* 10	90	7	* 2	2.5	4	* 100	24	* 0.5
DR459	140	16	6	* 100	9	620	59	28	61	2	* 2	2.4	3	* 100	26	* 0.5
DR460	5	22	* 5	510	1	24	66	14	70	7	* 2	3.6	6	* 100	29	* 0.5
DR461	* 5	* 1	* 5	310	* 1	* 10	31	* 10	54	6	* 2	1.1	7	* 100	15	* 0.5
DR462	46	4	* 5	130	* 1	33	26	* 10	* 50	5	* 2	1.8	3	* 100	10	* 0.5
DR463	13	2	* 5	290	* 1	14	14	* 10	* 50	2	* 2	1.3	* 2	* 100	6	* 0.5
DR464	* 5	8	* 5	* 100	* 1	* 10	24	* 10	* 50	2	* 2	1.7	* 2	* 100	11	* 0.5
DR465	* 5	18	* 5	* 100	* 1	* 10	47	* 10	* 50	7	* 2	1.8	4	* 100	19	* 0.5
DR466	* 5	3	* 5	* 100	* 1	* 10	11	* 10	* 50	4	* 2	2.0	* 2	* 100	* 5	* 0.5
DR467	* 5	4	* 5	* 100	* 1	* 10	54	10	65	24	* 2	2.3	8	* 100	22	* 0.5
DR468	* 5	5	* 5	* 100	* 1	* 10	21	* 10	* 50	4	* 2	1.5	* 2	* 100	8	* 0.5
DR469	* 5	6	5	* 100	* 1	* 10	80	* 10	* 50	17	* 2	1.9	10	* 100	24	* 0.5
DR470	* 5	6	6	* 100	* 1	* 10	87	* 10	* 50	12	* 2	2.9	9	* 100	41	* 0.5
DR471	* 5	5	* 5	* 100	* 1	* 10	94	* 10	* 50	17	* 2	2.4	6	* 100	40	0.5
DR472	* 5	2	* 5	* 100	* 1	* 10	31	* 10	* 50	8	* 2	2.0	7	* 100	13	* 0.5
DR473	* 5	6	* 5	510	2	* 10	110	15	* 50	6	* 2	3.6	7	* 100	39	* 0.5
DR474	* 5	4	* 5	540	1	* 10	84	* 10	* 50	5	* 2	3.8	9	* 100	33	0.9
DR475	* 5	4	* 5	190	3	19	100	* 10	* 50	17	* 2	2.9	7	* 100	30	* 0.5
DR476	* 5	4	* 5	320	1	* 10	93	* 10	* 50	3	* 2	2.9	8	* 100	35	* 0.5
DR477	* 5	6	* 5	140	3	* 10	110	12	* 50	4	* 2	2.8	8	* 100	41	0.7

no.	Mo (Ppm)	Na (Pct)	Ni (Ppm)	Rb (Ppm)	Sb (Ppm)	Sc (Ppm)	Se (Ppm)	Sm (Ppm)	Sn (Ppm)	Ta (Ppm)	Tb (Ppm)	Te (Ppm)	Th (Ppm)	U (Ppm)	W (Ppm)	Yb (Ppm)	Zn (Ppm)	Zr (Ppm)
DR445	* 2	0.10	* 50	26	1.6	2.2	* 10	1.0	* 200	* 1	* 1	* 20	1.9	1.5	3	* 5	830	* 500
DR446	2	0.11	* 50	31	1.0	1.9	* 10	1.6	* 200	* 1	* 1	* 20	2.3	2.1	3	* 5	950	* 500
DR447	17	* 0.05	* 50	* 10	145.0	* 0.5	* 10	* 0.2	< 420	* 1	* 1	< 41	< 1.1	7.3	< 6	* 5	>20000	< 1000
DR448	2	* 0.05	* 50	18	31.8	1.7	* 10	0.9	* 200	* 1	* 1	* 20	0.8	3.4	2	* 5	2800	* 500
DR449	3	0.27	* 50	240	0.6	7.9	* 10	4.7	* 200	* 1	* 1	* 20	8.4	3.8	2	* 5	580	* 500
DR450	3	0.55	26	320	1.7	10.0	* 10	5.1	* 200	* 1	* 1	* 20	7.5	2.9	* 2	* 5	* 200	* 500
DR451	2	0.13	* 50	200	0.8	3.8	* 10	3.8	* 200	* 1	* 1	* 20	6.0	8.1	5	* 5	590	* 500
DR452	* 2	0.43	34	380	0.9	14.0	* 10	5.8	* 200	1	* 1	* 20	11.0	4.5	2	* 5	* 200	* 500
DR453	3	0.33	* 50	270	0.7	9.2	* 10	5.4	* 200	1	1	* 20	10.0	4.1	4	* 5	580	630
DR454	19	0.31	* 20	300	0.8	7.6	* 10	4.3	* 200	1	* 1	* 20	7.3	4.4	* 2	* 5	* 200	* 500
DR455	22	0.55	34	300	4.7	11.0	* 10	4.9	* 200	* 1	* 1	* 20	8.3	3.0	6	* 5	1000	* 500
DR456	46	0.09	* 50	110	0.6	6.5	* 10	4.1	* 200	* 1	* 1	* 20	6.5	2.6	6	* 5	5000	* 500
DR457	260	0.12	* 50	150	1.0	6.5	* 10	4.0	* 200	* 1	* 1	* 20	7.6	4.6	11	* 5	>20000	* 500
DR458	2	0.20	55	200	0.7	8.2	* 10	4.8	* 200	* 1	* 1	* 20	8.1	3.2	6	* 5	9400	* 500
DR459	700	0.06	* 20	70	3.4	7.0	* 10	3.2	* 200	* 1	* 1	* 20	7.1	10.0	26	* 5	>30000	* 500
DR460	4	0.21	32	200	1.7	11.0	* 10	4.7	* 200	* 1	* 1	* 20	8.1	3.2	7	* 5	3000	* 500
DR461	5	0.19	* 50	240	0.4	3.7	* 10	3.8	* 200	* 1	* 1	* 20	5.9	2.7	6	* 5	690	* 500
DR462	22	0.14	* 50	76	0.4	3.7	* 10	2.7	* 200	* 1	* 1	* 20	4.0	2.9	10	* 5	3000	* 500
DR463	2	0.12	* 50	28	0.9	0.7	* 10	1.0	* 200	* 1	* 1	* 20	0.8	1.2	10	* 5	2300	* 500
DR464	3	0.07	* 20	15	0.8	2.8	* 10	1.5	* 200	* 1	* 1	* 20	2.5	1.6	7	* 5	1000	* 500
DR465	20	0.09	* 20	66	2.1	2.6	* 10	3.0	* 200	* 1	* 1	* 20	3.6	2.9	19	* 5	990	* 500
DR466	5	0.14	* 20	72	0.5	1.3	* 10	1.5	* 200	* 1	* 1	* 20	2.0	0.6	6	* 5	330	* 500
DR467	4	0.19	* 20	440	1.2	7.9	* 10	4.0	* 200	* 1	* 1	* 20	7.8	2.6	4	* 5	1400	* 500
DR468	5	0.16	* 20	46	0.8	1.3	* 10	1.3	* 200	* 1	* 1	* 20	1.2	1.2	8	* 5	1000	* 500
DR469	4	0.15	* 20	220	2.1	4.0	* 10	4.6	* 200	1	* 1	* 20	6.7	2.8	5	* 5	260	* 500
DR470	4	0.90	* 20	280	0.9	3.9	* 10	4.5	* 200	3	* 1	* 20	25.0	7.2	7	6	550	* 500
DR471	3	0.43	* 20	300	2.6	4.1	* 10	5.4	* 200	2	* 1	* 20	19.0	5.4	7	6	340	* 500
DR472	2	0.15	* 20	170	1.3	3.7	* 10	2.3	* 200	* 1	* 1	* 20	5.6	1.9	6	* 5	690	* 500
DR473	* 2	0.24	* 20	200	3.3	7.6	* 10	7.6	* 200	* 1	1	* 20	10.0	6.7	11	6	600	* 500
DR474	7	0.36	* 20	230	2.3	7.9	* 10	6.2	* 200	6	* 1	* 20	14.0	7.3	8	9	570	* 500
DR475	6	0.26	* 20	480	2.5	2.8	* 10	6.1	* 200	* 1	* 1	* 20	6.3	4.4	11	* 5	9700	500
DR476	3	0.22	* 20	190	3.1	7.9	* 10	6.4	* 200	1	* 1	* 20	14.0	5.7	14	6	1000	* 500
DR477	* 2	0.29	* 20	130	1.4	4.3	* 10	7.3	* 200	* 1	1	* 20	8.6	2.9	23	6	1300	* 500

* The displayed value represents the lower detection limit for the test for that element.

< The displayed value represents the elevated lower detection limit for the test for that element. The LDL is elevated due to the presence of certain other elements in the sample.

> The displayed value represents the upper detection limit for the test for that element.

APPENDIX C.

ASSAYS OF RECONNAISSANCE ROCK-CHIP SAMPLES BY CHEMEX LABS, INC. USING THE INDUCTIVELY COUPLED PLASMA METHOD

Element	Detection limit [lower/upper (if applicable)]
Ag (silver)	0.2 ppm/200 ppm
Al (aluminum)	0.01%/15.00%
As (arsenic)	2 ppm/10,000 ppm
Ba (barium)	10 ppm/10,000 ppm
Be (beryllium)	0.5 ppm/100.0 ppm
Bi (bismuth)	2 ppm/10,000 ppm
Ca (calcium)	0.01%/15.00%
Cd (cadmium)	0.5 ppm/100 ppm
Co (cobalt)	1 ppm/10,000 ppm
Cr (chromium)	1 ppm/10,000 ppm
Cu (copper)	1 ppm/10,000 ppm
Fe (iron)	0.01%/15.00%
Ga (gallium)	10 ppm/10,000 ppm
Hg (mercury)	1 ppm/10,000 ppm
K (potassium)	0.01%/10.00%
La (lanthanum)	10 ppm/10,000 ppm
Mg (magnesium)	0.01%/15.00%
Mn (manganese)	5 ppm/10,000 ppm
Mo (molybdenum)	1 ppm/10,000 ppm
Na (sodium)	0.01%/5.00%
Ni (nickel)	1 ppm/10,000 ppm
P (phosphorus)	10 ppm/10,000 ppm
Pb (lead)	2 ppm/10,000 ppm
Sb (antimony)	2 ppm/10,000 ppm
Sc (scandium)	1 ppm/10,000 ppm
Sr (strontium)	1 ppm/10,000 ppm
Ti (titanium)	0.01%/5.00%
Tl (thallium)	10 ppm/10,000 ppm
U (uranium)	10 ppm/10,000 ppm
V (vanadium)	1 ppm/10,000 ppm
W (tungsten)	10 ppm/10,000 ppm
Zn (zinc)	2 ppm/10,000 ppm

Appendix C.--Assays of reconnaissance rock-chip samples by Chemex Labs, Inc., using inductively-coupled plasma method (Dragoon Mountains Unit). ***NOTE: CERTAIN MARBLE SAMPLES NOT ASSAYED (DR17-23, 28-29, 34-35, 39-50).***

no.	Ag (Ppm)	Al (Pct)	As (Ppm)	Ba (Ppm)	Be (Ppm)	Bi (Ppm)	Ca (Pct)	Cd (Ppm)	Co (Ppm)	Cr (Ppm)	Cu (Ppm)	Fe (Pct)	Ga (Ppm)	Hg (Ppm)	K (Pct)	La (Ppm)	Mg (Pct)	Mn (Ppm)	Mo (Ppm)	Na (Pct)	Ni (Ppm)	P (Ppm)	Pb (Ppm)	Sb (Ppm)	Sc (Ppm)	Sr (Ppm)	Ti (Pct)	Tl (Ppm)	U (Ppm)	V (Ppm)	W (Ppm)	Zn (Ppm)
DR001	2.0	0.49	8	80	0.5	*10	1.35	13.0	4	8	300	1.75	10	*1	0.15	*10	0.53	280	123	0.02	4	280	1748	*2	1	23	*0.01	10	20	32	10	2210
DR002	*1.0	0.08	*2	10	*0.5	*10	>15.00	2.5	*1	19	25	0.48	*10	1	*0.01	*10	8.37	710	15	0.03	6	160	140	*2	*1	93	*0.01	*10	10	11	*10	294
DR003	4.0	0.28	*2	130	0.5	15	>15.00	>100.0	4	20	222	1.40	*10	*1	0.12	10	6.44	2005	17	0.03	8	290	1508	2	2	128	*0.01	*10	40	11	30	6440
DR004	6.0	0.04	190	10	*0.5	*10	>15.00	>100.0	21	15	702	0.24	*10	3	0.01	*10	1.25	645	7	0.02	5	80	1936	*2	*1	106	*0.01	*10	30	30	300	>10000
DR005	*1.0	0.22	*2	10	*0.5	*10	>15.00	8.0	*1	30	11	0.23	*10	*1	*0.01	*10	6.19	300	1	0.09	*1	*10	22	6	1	181	*0.01	*10	10	16	10	760
DR006	11.0	0.18	4	10	0.5	*10	>15.00	42.0	4	11	101	3.23	*10	*1	0.03	*10	8.03	825	3	0.03	4	60	5818	4	1	111	*0.01	*10	10	14	40	4686
DR007	3.4	1.26	30	90	1.0	16	>15.00	13.5	15	82	229	3.03	*10	2	0.63	60	1.16	4375	7	0.10	10	1350	1210	5	3	225	0.01	*10	30	12	*10	1838
DR008	>200.0	0.18	60	30	0.5	*2	1.62	64.5	5	265	5359	5.13	*10	*1	0.07	*10	0.28	855	25	0.02	11	40	>10000	110	*1	291	*0.01	20	40	1	20	>10000
DR009	*1.0	0.13	*2	10	*0.5	*10	>15.00	1.0	*1	20	10	1.08	*10	*1	0.07	*10	7.86	815	*1	0.02	3	140	156	8	1	164	*0.01	*10	10	9	10	184
DR010	4.0	0.32	24	10	1.0	*10	>15.00	25.0	8	16	440	3.07	*10	*1	0.11	20	0.90	1190	30	0.04	13	750	1824	6	2	202	0.01	*10	*10	6	20	2096
DR011	14.0	0.59	42	40	1.0	*10	8.53	58.5	13	11	349	3.26	*10	1	0.17	30	0.69	795	11	0.02	19	610	4300	*2	2	118	*0.01	*10	20	9	30	4962
DR012	1.0	0.47	12	180	0.5	*10	>15.00	3.5	15	32	86	2.46	*10	*1	0.18	*10	8.01	730	64	0.03	38	610	964	8	3	61	0.01	10	20	26	20	522
DR013	*1.0	0.30	12	7800	*0.5	60	>15.00	1.0	3	24	21	0.81	*10	2	0.06	*10	0.32	240	18	0.02	8	400	1996	12	1	313	*0.01	10	20	15	*10	152
DR014	*1.0	0.31	*2	40	0.5	*10	>15.00	1.5	7	20	26	0.79	*10	*1	0.09	*10	1.22	220	90	0.03	16	340	72	4	1	421	*0.01	*10	30	12	*10	230
DR015	*1.0	0.53	*2	30	*0.5	*10	>15.00	1.5	2	26	11	0.51	*10	*1	0.06	*10	0.65	185	73	0.03	5	50	24	4	1	416	0.01	*10	30	13	*10	94
DR016	*1.0	0.12	*2	60	*0.5	*10	>15.00	1.0	3	15	22	0.41	*10	*1	0.05	*10	0.34	115	8	0.04	6	90	76	*2	*1	532	*0.01	*10	*10	8	*10	148
DR024	*1.0	1.03	*2	40	0.5	*10	>15.00	1.0	*1	30	20	1.07	*10	*1	0.04	10	1.34	115	*1	0.25	24	380	*2	6	1	404	*0.01	*10	*10	15	10	132
DR025	*1.0	1.66	*2	*10	0.5	*10	>15.00	1.0	5	29	6	1.86	*10	*1	0.03	10	2.28	115	*1	0.02	26	350	6	8	2	469	*0.01	*10	10	21	10	58
DR026	*1.0	1.52	14	20	1.0	*10	>15.00	0.5	7	36	15	2.23	*10	3	0.06	10	2.16	170	13	0.03	28	600	22	*2	2	228	*0.01	*10	20	26	10	70
DR027	*1.0	0.14	*2	20	*0.5	*10	>15.00	*0.5	*1	13	9	0.23	*10	*1	0.05	*10	0.50	115	2	0.02	6	40	*2	4	*1	265	*0.01	*10	20	8	10	32
DR030	*1.0	0.09	*2	10	*0.5	*10	>15.00	0.5	2	11	12	0.34	*10	*1	0.03	*10	9.78	130	1	0.02	3	50	*2	4	*1	115	*0.01	*10	*10	12	10	24
DR031	0.6	0.92	*5	10	*0.5	2	>15.00	1.0	4	41	6	0.86	*10	2	0.14	30	1.00	175	1	0.03	9	130	8	10	1	209	*0.01	*10	*10	17	*10	94
DR032	*1.0	0.54	*2	20	*0.5	*10	>15.00	1.0	6	23	68	0.92	*10	*1	0.03	*10	0.73	175	2	0.05	11	*10	16	2	1	696	*0.01	*10	20	9	10	98
DR033	*1.0	0.22	*2	10	*0.5	*10	>15.00	0.5	3	21	12	0.81	*10	*1	0.04	*10	0.34	105	4	0.03	8	70	24	8	2	769	*0.01	*10	40	7	*10	66
DR036	7.4	0.24	8	70	*0.5	*2	11.64	2.5	1	81	46	0.54	*10	2	0.03	*10	0.50	105	10	0.01	8	*10	1414	4	*1	99	*0.01	*10	*10	9	*10	288
DR037	*0.2	0.15	6	60	*0.5	*2	9.83	*0.5	1	57	15	0.37	*10	2	0.04	*10	0.11	435	1	0.01	8	320	36	2	*1	125	*0.01	*10	*10	6	*10	24
DR038	*0.2	0.06	*2	10	*0.5	*2	>15.00	1.0	2	24	11	0.40	*10	1	*0.01	*10	5.91	395	*1	0.01	3	*10	14	4	*1	340	*0.01	*10	*10	3	*10	48
DR051	*1.0	0.55	38	10	*0.5	*10	0.17	*0.5	3	5	1108	1.10	*10	*1	0.06	*10	0.04	290	3	0.01	2	590	18	*2	*1	17	*0.01	*10	*10	10	10	94
DR052	*1.0	0.53	*2	10	*0.5	15	0.17	*0.5	3	3	268	2.04	10	*1	0.18	10	0.28	285	92	0.02	9	580	26	2	1	5	0.02	*10	*10	20	10	72
DR053	0.6	0.70	10	30	*0.5	*2	0.15	3.0	2	144	300	1.40	10	*1	0.31	20	0.29	305	11	0.04	11	450	70	5	1	9	0.02	*10	*10	17	*10	658
DR054	*1.0	0.64	*2	10	*0.5	*10	0.15	*0.5	8	11	466	2.47	10	*1	0.30	20	0.32	280	100	0.02	12	500	10	2	1	9	0.03	*10	*10	25	*10	92
DR055	1.8	0.76	5	40	*0.5	14	0.19	19.0	5	144	356	2.04	*10	*1	0.35	20	0.27	320	37	0.03	8	440	280	5	1	10	0.02	*10	*10	20	*10	2976
DR056	*1.0	0.77	*2	10	1.0	*10	10.74	*0.5	2	58	486	1.38	*10	*1	0.18	*10	0.97	955	3	0.03	14	320	16	4	1	78	0.15	*10	20	21	*10	188
DR057	2.0	3.35	14	140	12.0	*10	4.58	1.0	9	89	1654	3.52	10	*1	0.25	30	0.72	3365	12	0.03	28	2090	30	2	9	32	0.09	*10	10	46	20	1260
DR058	1.0	1.76	10	100	5.0	*10	6.18	*0.5	1	37	371	1.61	*10	*1	0.25	10	0.58	1100	6	0.07	18	910	4	18	2	58	0.13	*10	20	22	10	420
DR059	1.6	4.73	5	310	11.0	8	4.38	5.0	12	240	1568	4.95	20	*1	0.38	70	0.93	4575	23	0.10	65	1800	14	10	10	57	0.09	*10	*10	54	*10	1712
DR060	1.8	3.75	25	30	19.5	24	11.09	*0.5	11	208	226	4.09	10	7	0.08	*10	0.26	7810	2	0.03	18	600	98	20	6	25	0.23	*10	*10	81	*10	718
DR061	*0.2	1.52	15	30	1.5	*2	13.24	2.0	4	88	1693	4.25	*10	5	0.16	*10	0.30	4385	*1	0.03	10	530	28	5	2	40	0.05	*10	*10	51	20	466
DR062	0.2	1.27	10	30	8.0	8	4.85	0.5	4	229	546	2.04	10	*1	0.45	10	1.88	3370	4	0.11	8	1120	8	5	1	33	0.08	*10	*10	15	*10	568
DR063	1.8	1.81	*5	60	8.5	8	3.74	0.5	12	420	1299	6.84	10	*1	0.35	10	1.36	5505	10	0.05	22	3280	2	5	1	71	0.06	30	*10	41	*10	776
DR064	0.4	1.82	*5	50	7.5	*2	5.23	1.0	15	234	901	4.51	10	4	0.32	20	0.69	4415	4	0.07	13	1940	*2	5	6	52	0.14	*10	*10	43	*10	562
DR065	2.4	1.85	*5	80	2.5	2	10.99	5.0	13	113	1411	2.46	10	3	0.47	*10	1.08	5640	3	0.03	14	460	116	10	4	92	0.10	*10	*10	38	*10	1058
DR066	5.0	0.89	20	30	*0.5	4	0.80	*0.5	7	246	606	1.63	10	3	0.10	10	0.23	225	4	0.10	9	1610	1534	5	1	24	0.04	*10	*10	22	*10	128
DR067	*1.0	0.88	*2	20	1.0	*10	6.46	*0.5	1	15	1466	1.25	*10	*1	0.25	*10	0.62	685	184	0.04	6	760	8	14	1	67	0.11	*10	*10	13	*10	190
DR068	81.0	1.07	*2	20	1.5	446	13.14	5.0	3	28	>10000	1.17	*10	*1	0.04	10	0.78	2030	77	0.02	7	600	62	*2	1	75	0.06	*10	20	22	150	8242
DR069	4.0	0.38	*2	20	12.0	20	10.72	1.0	8	10	>10000	4.84	*10	*1	0.06	*10	0.46	3360	26	0.02	4	200	18	8	*1	22	*0.01	*10	10	49	<50	536
DR070	3.0	0.22	*2	20	*0.5	*10	8.05	*0.5	16	12	5667	2.82	*10	*1	0.06	*10	0.16	1325	29	0.03	6	350	34	6	1	60	0.01	*10	20	21	10	176
DR071	*1.0	2.65	*2	90	5.0	*10	2.05	*0.5	16	23	882	2.57	*10	*1	1.44	10	3.21	2675	9	0.03	18	2400	8	2	3	39	0.17	*10	10	24	20	652
DR072	1.0	0.61	*2	70	5.5	*10	>15.00	1.0	6	15	1404	3.22	*10	*1	0.09	*10	0.39	3425	11	0.02	9	1030	26	6	1	202	0.02	*10	10	28	20	364
DR073	*1.0	0.51	2	40	*0.5	*10	0.35	*0.5	4	22	79	2.56	*10	*1	0.27	10	0.28	155	4	0.02	13	210	18	*2	*1	32	0.07	*10	*10	17	10	80

Appendix C. con't.

no.	Ag (Ppm)	Al (Pct)	As (Ppm)	Ba (Ppm)	Be (Ppm)	Bi (Ppm)	Ca (Pct)	Cd (Ppm)	Co (Ppm)	Cr (Ppm)	Cu (Ppm)	Fe (Pct)	Ga (Ppm)	Hg (Ppm)	K (Pct)	La (Ppm)	Mg (Pct)	Mn (Pct)	Mo (Ppm)	Na (Pct)	Ni (Ppm)	P (Ppm)	Pb (Ppm)	Sb (Ppm)	Sc (Ppm)	Sr (Ppm)	Ti (Pct)	Tl (Ppm)	U (Ppm)	V (Ppm)	W (Ppm)	Zn (Ppm)
DR074	* 1.0	0.96	52	20	* 0.5	* 10	0.27	0.5	12	16	29	2.96	* 10	* 1	0.19	10	0.66	325	* 1	0.02	26	460	134	4	1	6	0.08	* 10	* 10	13	10	210
DR075	0.8	1.38	* 5	60	* 0.5	20	0.28	* 0.5	13	63	84	3.26	* 10	2	0.39	10	0.72	390	4	0.03	28	690	298	5	1	4	0.12	* 10	* 10	17	* 10	386
DR076	8.0	1.49	* 2	20	* 0.5	* 10	0.49	>100.0	8	21	308	5.00	* 10	* 1	0.25	10	1.74	1570	11	0.01	14	510	>10000	* 2	3	22	0.05	* 10	* 10	28	80	>10000
DR077	7.6	1.97	* 5	30	* 0.5	22	1.56	10.0	12	82	209	4.73	20	3	0.69	30	1.92	1665	8	0.01	16	820	>10000	5	4	31	0.08	20	30	29	20	1184
DR078	7.6	2.00	* 5	20	0.5	2	1.09	80.0	18	67	1820	5.61	* 10	* 1	0.97	30	2.23	2025	3	0.02	22	820	>10000	5	5	19	0.14	* 10	* 10	39	10	7680
DR079	8.0	2.43	* 2	20	* 0.5	* 10	1.55	29.5	14	24	441	5.06	* 10	* 1	0.90	20	2.91	1790	8	0.02	15	750	>10000	* 2	5	32	0.11	* 10	* 10	40	30	3448
DR080	21.0	0.96	24	10	11.0	117	10.00	>100.0	37	38	149	3.54	20	* 1	0.09	10	1.10	>10000	13	0.03	21	860	700	* 2	2	183	0.08	* 10	140	40	100	>10000
DR081	1.6	1.34	5	20	8.0	60	8.77	>100.0	43	98	99	3.91	* 10	* 1	0.33	10	0.72	>10000	3	0.03	21	640	252	5	3	188	0.08	* 10	* 10	27	90	>10000
DR082	35.0	1.21	22	* 10	9.0	81	1.32	12.0	87	20	1540	8.96	30	* 1	0.09	10	0.90	>10000	233	0.11	24	240	476	4	4	349	0.04	* 10	160	49	900	3446
DR083	2.0	0.92	18	* 10	1.0	10	0.47	5.5	* 1	6	85	1.65	30	* 1	0.04	30	0.32	995	28	0.04	10	580	120	* 2	2	29	0.01	* 10	* 10	18	10	702
DR084	47.0	2.22	* 2	80	5.5	61	0.88	25.5	19	38	672	2.77	30	6	0.12	40	0.62	>10000	23	0.04	38	840	882	* 2	5	96	0.02	10	* 10	30	20	3326
DR085	* 1.0	1.96	8	30	2.0	* 10	10.58	* 0.5	7	25	96	2.37	20	* 1	0.65	* 10	1.58	1320	3	0.03	13	590	500	10	6	65	0.10	* 10	* 10	49	10	498
DR086	26.6	3.68	* 5	100	3.5	98	6.48	27.5	59	104	962	6.66	20	4	0.69	40	0.87	>10000	78	0.12	35	470	1182	10	5	242	0.08	* 10	* 10	65	90	3464
DR087	68.8	1.15	20	10	12.0	14	2.12	>100.0	69	222	843	9.91	10	* 1	0.16	60	0.32	>10000	181	0.10	52	470	2010	5	3	926	0.05	* 10	160	48	130	>10000
DR088	4.8	1.13	5	20	30.5	70	>15.00	17.5	17	76	32	2.50	* 10	3	0.43	* 10	1.18	>10000	* 1	0.02	17	340	234	5	2	187	0.05	* 10	* 10	21	30	3568
DR089	2.0	0.69	8	* 10	1.0	* 10	>15.00	2.0	* 1	32	36	1.25	10	* 1	0.20	* 10	0.81	1365	* 1	0.02	12	340	96	8	2	159	0.03	10	* 10	20	10	624
DR090	5.0	0.29	10	60	* 0.5	4	0.22	1.5	9	244	34	0.90	10	* 1	* 0.01	10	0.08	240	3	0.04	7	260	676	5	1	12	0.06	* 10	10	13	* 10	764
DR091	2.0	0.54	30	50	* 0.5	* 2	0.31	5.5	7	77	99	1.11	10	6	* 0.01	20	0.59	1170	8	0.05	11	410	1806	5	2	11	0.13	* 10	* 10	21	* 10	1840
DR092	3.0	2.06	64	50	0.5	* 10	1.60	49.0	14	16	2069	9.01	30	* 1	0.79	20	1.45	1580	131	0.03	2	420	>10000	* 2	4	148	0.01	* 10	* 10	27	< 50	>10000
DR093	6.0	1.27	16	20	0.5	* 10	0.48	49.5	8	41	5005	>15.00	30	* 1	0.41	* 10	0.49	1765	25	0.02	9	480	>10000	* 2	5	56	0.02	* 10	* 10	71	< 50	>10000
DR094	2.0	1.16	42	30	1.5	10	0.51	11.5	1	9	1503	5.21	20	* 1	0.50	* 10	0.86	515	21	0.03	6	310	>10000	* 2	3	70	0.02	* 10	* 10	22	< 50	>10000
DR095	17.0	0.81	38	70	3.0	* 10	0.65	87.5	8	17	4126	9.98	20	* 1	0.20	10	0.39	1175	96	0.06	9	370	>10000	* 2	3	53	0.01	* 10	* 10	30	50	>10000
DR096	51.0	2.57	* 2	* 10	3.0	132	12.17	18.5	19	41	1211	3.21	10	* 1	0.01	10	1.52	4015	1	0.02	10	480	4060	* 2	4	185	0.20	* 10	10	29	30	3246
DR097	6.0	2.18	* 2	10	6.5	82	11.55	>100.0	26	38	75	2.48	10	* 1	0.17	10	1.10	3210	6	0.06	10	710	528	* 2	5	166	0.22	* 10	* 10	35	110	>10000
DR098	14.0	0.99	18	* 10	3.5	241	7.89	>100.0	86	10	1023	1.97	20	* 1	0.10	* 10	1.07	4315	11	0.04	11	690	934	* 2	2	77	0.04	10	* 10	15	250	>10000
DR099	2.0	2.40	* 2	30	3.5	* 10	2.62	24.0	19	32	132	3.13	30	* 1	0.33	* 10	1.14	1815	9	0.12	30	470	138	* 2	5	41	0.10	* 10	* 10	34	10	3424
DR100	7.0	0.61	16	* 10	2.0	229	1.73	>100.0	118	* 1	2613	1.71	20	* 1	0.01	* 10	0.63	1615	5	0.02	13	360	436	* 2	1	22	0.04	10	* 10	9	300	>10000
DR101	2.0	1.97	* 2	10	3.0	18	9.12	49.0	16	80	245	3.10	20	* 1	0.04	10	1.62	3570	10	0.05	9	920	160	* 2	3	108	0.20	* 10	20	25	40	7682
DR102	18.0	0.40	12	* 10	3.0	560	1.26	>100.0	134	6	3889	1.67	10	2	* 0.01	* 10	0.74	3060	13	0.03	11	660	1456	* 2	1	32	0.02	20	* 10	6	450	>10000
DR103	22.0	1.74	* 5	* 10	4.0	292	7.14	>100.0	102	36	5639	4.00	10	10	0.01	20	1.58	7500	10	0.02	14	1230	1024	5	3	123	0.16	* 10	* 10	16	220	>10000
DR104	21.6	1.64	30	20	3.5	266	10.10	>100.0	88	42	1582	2.61	* 10	11	0.06	* 10	1.02	5855	12	0.02	8	1100	1356	5	3	113	0.17	* 10	* 10	23	170	>10000
DR105	2.4	1.18	55	10	0.5	* 2	6.70	1.5	6	81	141	1.38	10	* 1	0.04	10	0.93	1430	3	0.03	6	760	162	10	3	92	0.18	* 10	* 10	17	* 10	482
DR106	3.8	0.34	30	10	* 0.5	2	1.08	* 0.5	4	309	36	0.75	30	* 1	0.04	20	0.21	190	6	0.02	4	430	492	10	1	11	0.04	* 10	* 10	10	* 10	356
DR107	* 1.0	1.27	16	10	2.0	* 10	>15.00	8.5	8	23	42	1.61	10	* 1	0.13	* 10	1.16	2100	3	0.03	14	680	64	2	2	124	0.09	* 10	* 10	16	20	1988
DR108	10.0	1.51	* 2	20	4.0	32	7.33	>100.0	24	66	48	3.58	10	* 1	0.10	10	1.08	2215	29	0.02	11	2540	510	* 2	3	77	0.12	* 10	10	23	60	>10000
DR109	24.2	1.72	35	10	1.5	72	13.61	>100.0	56	36	52	2.17	* 10	* 1	0.06	* 10	1.29	3360	65	0.01	5	1990	948	5	3	135	0.13	* 10	* 10	19	80	>10000
DR110	26.0	0.63	4	10	1.5	82	10.25	>100.0	36	9	48	1.07	20	* 1	0.06	* 10	0.78	2160	31	0.02	12	810	1552	* 2	1	81	0.03	10	* 10	10	100	>10000
DR111	1.4	2.56	* 5	170	* 0.5	24	8.83	6.5	10	36	73	1.57	* 10	5	0.92	* 10	1.72	285	* 1	0.07	16	1360	1732	10	3	225	0.09	* 10	* 10	39	* 10	1166
DR112	50.2	0.06	55	* 10	* 0.5	* 2	0.75	>100.0	115	16	47	0.93	* 10	* 1	0.02	* 10	0.05	1860	5	0.03	3	380	>10000	5	* 1	45	0.02	30	* 10	2	430	>10000
DR113	44.2	0.29	5	10	0.5	2	2.30	>100.0	51	17	148	1.01	* 10	* 1	0.04	* 10	0.96	2095	4	0.03	* 1	160	>10000	5	* 1	85	0.02	* 10	* 10	7	290	>10000
DR114	1.2	3.61	5	150	1.5	10	10.09	5.5	9	228	10	2.38	10	* 1	1.47	30	1.85	200	2	0.05	26	350	1130	5	5	215	0.13	* 10	* 10	45	* 10	862
DR115	* 0.2	2.41	5	50	0.5	* 2	>15.00	1.0	8	71	11	1.75	* 10	* 1	1.14	* 10	1.78	290	* 1	0.06	22	290	20	5	5	758	0.09	* 10	* 10	35	10	128
DR116	2.4	2.68	5	80	0.5	18	>15.00	4.0	5	48	58	1.66	* 10	* 1	0.84	* 10	1.98	440	1	0.07	16	410	3056	20	5	500	0.12	* 10	10	44	10	1102
DR117	88.4	0.08	* 5	30	* 0.5	48	0.55	>100.0	92	9	157	0.90	* 10	* 1	0.02	* 10	0.22	1785	7	0.01	6	880	>10000	5	* 1	33	0.01	20	10	* 1	290	>10000
DR118	165.0	1.98	* 5	30	* 0.5	332	8.00	>100.0	37	44	394	1.57	* 10	* 1	0.13	10	0.84	1495	1	0.10	18	780	>10000	5	4	401	0.27	* 10	* 10	65	60	>10000
DR119	0.8	4.37	5	270	2.0	* 2	7.84	2.5	35	311	132	5.82	10	* 1	0.38	20	4.82	845	2	0.10	222	3290	88	5	15	146	0.46	* 10	* 10	141	* 10	1110
DR120	0.8	3.41	20	800	1.5	6	5.16	* 0.5	34	194	106	5.42	10	1	1.32	20	3.94	645	1	0.27	251	3090	92	5	9	127	0.60	* 10	* 10	137	* 10	228
DR121	5.6	1.56	30	50	2.5	20	3.32	3.0	26	67	3364	8.74	10	* 1	0.17	20	0.72	1105	280	0.03	7	890	>10000	5	3	39	0.04	30	* 10	118	* 10	3888
DR122	70.4	3.40	20	30	1.5	140	2.04	22.5	120	13	>10000	5.34	10	* 1	0.59	30	1.82	655	88	0.06	47	1400	>10000	30	13	318	0.49	* 10	10	112	1750	>10000
DR123	>200.0	0.67	30	20	* 0.5	600	0.23	9.5	32	84	>10000	1.88	20	* 1	0.10	20	0.13	210	305	0.02	9	200	>10000	70	1	336	* 0.01	* 10	60	11	90	4952
DR124	200.0	0.46	8	30	* 0.5	300	0.28	15.5	46	12	>10000	1.31	10	* 1	0.03	10	0.27	135	387	0.02	16	400	>10000	100	1	155	* 0.01	* 10	100	12	< 50	>10000
DR125	112.0	2.17	60	30	3.5	180	4.49	>100.0	103	45	>10000	8.90	10	* 1	0.22	40	1.22	800	407	0.03	27	780	>10000	5	7	596	0.25	* 10	* 10	73	< 50	>10000
DR126	14.0	1.55	28	60	2.0	* 10	10.98	25.0	36	34	2490	4.26	* 10	* 1	0.27	10	1.29	770	123	0.06	31	1660	9972	2	5	163	0.17	* 10	* 10	188	130	7368

Appendix C. con't.

no.	Ag (Ppm)	Al (Pct)	As (Ppm)	Ba (Ppm)	Be (Ppm)	Bi (Ppm)	Ca (Pct)	Cd (Ppm)	Co (Ppm)	Cr (Ppm)	Cu (Ppm)	Fe (Pct)	Ga (Ppm)	Hg (Ppm)	K (Pct)	La (Ppm)	Mg (Pct)	Mn (Pct)	Mo (Ppm)	Na (Pct)	Ni (Ppm)	P (Ppm)	Pb (Ppm)	Sb (Ppm)	Sc (Ppm)	Sr (Ppm)	Ti (Pct)	Tl (Ppm)	U (Ppm)	V (Ppm)	W (Ppm)	Zn (Ppm)
DR127	59.6	3.43	30	40	* 0.5	154	1.25	11.5	36	80	8572	14.47	20	3	0.18	50	1.43	565	10	0.01	58	1250	>10000	10	9	122	0.26	* 10	* 10	154	20	>10000
DR128	5.4	2.60	25	120	0.5	20	4.34	3.0	15	21	633	3.48	* 10	6	0.56	30	1.67	405	* 1	0.25	35	1600	536	5	8	180	0.67	* 10	* 10	110	* 10	574
DR129	10.6	2.25	20	60	1.0	38	3.51	48.0	27	20	1587	2.92	10	4	0.48	20	1.81	445	4	0.13	31	1730	4048	5	10	163	0.63	20	* 10	155	* 10	7192
DR130	27.0	0.84	34	30	3.0	121	12.81	18.5	7	25	1483	1.56	10	1	0.02	10	1.39	4370	16	0.03	14	640	1998	* 2	2	125	0.04	* 10	* 10	53	150	2562
DR131	60.0	1.95	2	40	6.5	78	4.57	>100.0	14	31	987	>15.00	10	* 1	0.25	* 10	0.60	1690	11	0.13	22	930	7364	2	4	167	0.20	* 10	10	47	< 50	>10000
DR132	3.2	2.91	20	120	2.0	22	4.55	1.0	15	19	190	2.83	10	* 1	0.91	30	1.92	1115	5	0.06	13	3300	236	10	10	177	0.37	10	* 10	139	* 10	464
DR133	1.8	3.56	35	70	1.0	* 2	5.04	34.5	14	71	115	2.82	10	* 1	0.54	20	0.97	875	5	0.30	39	1550	186	5	2	329	0.42	* 10	* 10	70	* 10	5648
DR134	2.8	2.05	* 5	50	0.5	14	0.31	2.5	2	179	31	1.76	* 10	* 1	0.47	10	0.65	425	4	0.10	8	210	146	5	4	19	0.08	10	* 10	24	* 10	512
DR135	1.4	0.56	* 5	20	0.5	* 2	0.36	3.5	5	505	30	1.61	* 10	* 1	0.20	10	0.20	900	9	0.05	16	180	334	5	* 1	10	0.06	* 10	20	12	* 10	562
DR136	0.4	2.44	15	30	0.5	4	4.53	8.0	5	51	206	1.27	* 10	1	0.23	* 10	0.37	1475	2	0.06	11	850	118	5	3	96	0.09	* 10	* 10	17	* 10	1244
DR137	2.0	3.92	8	90	1.5	* 10	3.33	2.0	16	29	206	4.29	30	* 1	0.50	* 10	1.34	2075	* 1	0.11	25	720	514	2	10	92	0.23	* 10	* 10	93	* 10	1514
DR138	1.0	0.65	18	20	0.5	* 10	3.71	1.5	1	1	108	0.98	20	* 1	0.10	* 10	0.32	345	8	0.02	8	320	698	2	1	34	0.01	* 10	* 10	13	10	734
DR139	3.0	2.47	40	160	2.0	* 10	1.90	28.5	18	37	312	5.25	30	2	0.50	* 10	1.56	4085	2	0.04	20	990	294	* 2	9	45	0.14	* 10	* 10	103	20	3394
DR140	10.6	2.50	30	30	8.5	154	8.51	10.5	12	61	522	4.38	10	* 1	0.42	20	1.60	6115	4	0.04	10	710	326	5	5	222	0.15	* 10	20	52	* 10	3610
DR141	7.4	1.65	25	30	4.5	4	3.34	10.5	8	91	381	5.11	* 10	* 1	0.31	10	1.45	2925	14	0.04	11	720	2552	5	3	80	0.14	10	* 10	51	* 10	4968
DR142	33.0	3.49	16	50	22.0	345	10.28	10.0	47	17	>10000	13.32	10	* 1	0.38	* 10	2.47	6885	15	0.07	16	< 200	958	2	8	180	0.16	* 10	* 10	71	< 50	9650
DR143	16.0	1.96	* 2	120	4.0	64	8.41	>100.0	10	27	1404	7.36	* 10	* 1	1.14	* 10	3.02	2100	225	0.03	6	1020	1164	* 2	2	195	0.11	* 10	20	25	100	>10000
DR144	55.0	1.95	* 2	100	1.0	308	13.01	>100.0	6	26	2774	4.95	* 10	* 1	1.41	* 10	6.07	3150	20	0.05	10	280	>10000	* 2	2	332	0.07	* 10	10	28	150	>10000
DR145	25.6	1.17	* 5	70	0.5	100	4.85	>100.0	10	101	1379	7.72	* 10	* 1	0.44	10	1.55	3105	21	0.04	4	350	5248	5	1	102	0.07	10	* 10	11	50	>10000
DR146	6.0	1.95	4	110	0.5	25	>15.00	>100.0	* 1	23	80	1.05	* 10	* 1	0.73	* 10	3.59	1260	12	0.06	9	130	>10000	* 2	1	449	0.07	* 10	* 10	19	50	>10000
DR147	16.0	0.62	* 2	10	0.5	* 10	>15.00	>100.0	2	21	790	1.88	* 10	* 1	0.17	* 10	6.44	6100	518	0.04	* 1	190	2734	* 2	1	207	0.03	* 10	* 10	29	250	>10000
DR148	25.0	0.11	* 2	10	4.5	55	>15.00	>100.0	4	13	104	0.54	* 10	* 1	0.07	* 10	5.24	1990	15	0.03	3	10	>10000	* 2	* 1	252	*0.01	* 10	30	6	100	>10000
DR149	37.4	1.27	* 5	10	* 0.5	124	3.08	>100.0	21	55	2205	11.88	* 10	* 1	0.11	* 10	0.36	3880	4	0.04	16	1410	>10000	5	1	130	0.09	* 10	* 10	19	130	>10000
DR150	1.4	2.19	35	30	22.5	38	>15.00	* 0.5	9	74	597	3.77	* 10	* 1	0.13	* 10	1.56	3640	2	0.01	11	1070	30	10	4	163	0.14	* 10	* 10	23	20	316
DR151	* 1.0	4.73	14	* 10	43.5	56	14.58	5.0	11	77	111	10.99	* 10	1	0.12	* 10	1.04	5740	30	0.02	5	1310	34	6	7	403	0.26	* 10	* 10	18	110	1110
DR152	* 1.0	1.93	* 2	20	1.0	18	>15.00	* 0.5	12	32	13	3.32	* 10	* 1	1.23	* 10	1.97	1235	19	0.48	6	130	6	8	2	177	*0.01	* 10	* 10	4	2060	284
DR153	1.0	2.17	* 2	* 10	23.5	14	12.83	2.0	12	29	25	6.35	* 10	* 1	0.41	* 10	4.49	4745	4	0.04	9	70	48	4	1	200	*0.01	* 10	* 10	10	150	782
DR154	* 1.0	3.32	* 2	10	29.5	18	>15.00	0.5	16	57	20	9.99	* 10	* 1	0.56	* 10	1.89	5100	17	0.03	14	110	22	12	2	424	*0.01	* 10	* 10	7	800	392
DR155	3.0	1.29	* 2	* 10	34.5	158	11.42	* 0.5	11	32	28	>15.00	* 10	1	0.03	* 10	0.48	6220	20	0.06	12	20	238	4	2	68	0.01	* 10	10	10	400	216
DR156	* 1.0	2.94	6	20	2.0	8	4.21	* 0.5	10	76	26	3.28	20	* 1	0.44	10	1.14	1685	12	0.02	23	2140	18	10	4	231	0.12	* 10	* 10	28	* 10	118
DR157	* 1.0	1.11	14	* 10	>100.0	40	>15.00	2.5	4	18	9	1.52	* 10	* 1	0.11	* 10	0.33	3130	8	0.04	1	170	22	10	1	226	0.01	* 10	* 10	7	80	980
DR158	* 1.0	1.67	2	* 10	2.0	4	5.43	* 0.5	2	29	* 1	3.66	* 10	* 1	0.14	* 10	0.21	1650	3	0.01	* 1	30	16	4	1	192	0.01	* 10	* 10	9	10	120
DR159	29.0	0.34	16	* 10	7.0	240	4.56	>100.0	289	18	>10000	4.20	* 10	* 1	* 0.01	* 10	0.44	1880	* 1	0.01	27	2400	300	* 2	1	70	0.02	* 10	* 10	9	300	>10000
DR160	* 1.0	2.74	6	* 10	30.0	18	>15.00	56.5	27	99	425	4.84	* 10	1	0.07	* 10	2.07	6085	8	0.02	26	1010	40	2	5	385	0.20	* 10	* 10	47	150	>10000
DR161	4.0	2.48	16	* 10	22.5	168	10.02	>100.0	144	75	354	3.33	* 10	* 1	0.01	* 10	1.40	7280	197	0.02	34	900	250	* 2	4	224	0.09	* 10	* 10	33	260	>10000
DR162	17.0	0.47	10	* 10	5.5	180	13.86	>100.0	238	20	>10000	2.82	* 10	* 1	0.05	* 10	0.74	2720	* 1	0.04	30	1200	210	* 2	* 1	144	0.01	* 10	* 10	7	300	>10000
DR163	2.0	0.98	* 2	* 10	10.5	82	14.14	>100.0	31	31	1453	3.26	* 10	* 1	0.02	* 10	0.48	5265	4	0.02	6	730	124	* 2	1	166	0.06	* 10	* 10	6	50	>10000
DR164	13.0	1.24	8	* 10	50.0	210	9.03	>100.0	181	81	8748	4.19	* 10	* 1	0.01	* 10	0.99	9945	5	0.02	22	2340	424	* 2	2	89	0.06	* 10	* 10	23	390	>10000
DR165	* 1.0	1.84	2	70	3.0	8	0.68	18.5	15	108	208	2.76	10	* 1	0.79	20	0.69	645	9	0.02	33	440	18	* 2	5	11	0.09	20	* 10	28	* 10	4146
DR166	6.0	1.63	* 2	* 10	82.5	102	>15.00	>100.0	50	49	5263	6.96	* 10	1	0.18	* 10	2.14	>10000	10	0.07	19	460	118	* 2	2	136	0.04	* 10	* 10	15	730	>10000
DR167	1.0	1.05	* 2	* 10	15.0	16	6.64	65.5	23	36	162	3.70	* 10	* 1	0.03	* 10	0.82	5475	58	0.01	7	210	54	* 2	1	76	0.03	* 10	* 10	18	40	>10000
DR168	1.0	3.27	* 2	* 10	11.0	4	12.13	0.5	11	79	302	5.31	* 10	* 1	* 0.01	10	0.31	6335	19	0.01	4	1170	196	8	4	325	0.27	* 10	20	44	30	292
DR169	2.0	2.57	* 2	* 10	17.0	* 2	12.88	3.5	12	60	351	6.10	* 10	* 1	0.01	10	0.48	7430	16	0.01	10	330	376	4	3	285	0.12	* 10	20	25	40	726
DR170	* 1.0	1.66	* 2	* 10	23.0	* 2	>15.00	0.5	22	84	159	7.15	* 10	* 1	0.01	* 10	0.40	>10000	5	0.01	2	210	38	2	2	181	0.08	* 10	20	20	60	208
DR171	6.0	1.27	10	* 10	16.0	* 10	11.66	16.0	49	6	723	8.30	* 10	* 1	0.01	* 10	1.17	8915	13	0.03	13	920	222	2	4	118	0.14	* 10	10	19	60	4060
DR172	6.0	1.89	* 2	* 10	2.0	* 10	11.44	8.5	42	288	4123	2.95	* 10	* 1	0.08	* 10	0.91	1705	21	0.11	89	870	88	4	14	68	0.23	* 10	* 10	82	* 10	944
DR173	30.0	3.13	* 2	10	5.0	112	4.32	5.0	23	104	2160	4.31	30	4	1.45	10	4.10	3595	6	0.02	19	860	556	* 2	3	270	0.11	* 10	* 10	32	30	4888
DR174	72.0	3.79	* 2	10	5.5	340	4.88	6.5	37	83	>10000	7.10	30	* 1	0.87	10	3.62	4225	8	0.01	17	1200	928	* 2	4	201	0.13	* 10	10	36	< 50	5910
DR175	107.0	1.63	14	* 10	1.0	352	4.91	20.0	13	280	4787	2.91	* 10	1	0.02	10	0.29	1485	731	0.01	12	1600	>10000	* 2	3	140	0.13	* 10	10	70	20	5050
DR176	* 1.0	2.48	* 2	100	2.0	* 2	9.29	0.5	6	52	40	1.86	* 10	* 1	0.06	10	0.53	4145	2	0.06	7	410	26	* 2	6	236	0.28	* 10	20	45	10	140
DR177	* 1.0	3.36	* 2	200	2.5	* 2	4.83	0.5	5	73	33	1.61	10	6	0.22	20	1.42	3020	7	0.02	9	130	28	* 2	3	185	0.01	* 10	* 10	25	10	226
DR178	* 1.0	0.40	* 2	10	4.5	* 2	0.54	0.5	3	221	31	0.98	* 10	* 1	0.01	* 10	0.11	355	6	0.01	5	80	34	* 2	* 1	27	0.02	* 10	* 10	6	* 10	152
DR179	15.0	2.94	* 2	20	30.0	* 2	11.77	8.5	36	48	1086	8.84	10	* 1	0.02	10	0.83	>10000	7	0.02	17	170	880	* 2	3	367	0.06	* 10	60	41	90	3554

Appendix C. con't.

no.	Ag (Ppm)	Al (Pct)	As (Ppm)	Ba (Ppm)	Be (Ppm)	Bi (Ppm)	Ca (Pct)	Cd (Ppm)	Co (Ppm)	Cr (Ppm)	Cu (Ppm)	Fe (Pct)	Ga (Ppm)	Hg (Ppm)	K (Pct)	La (Ppm)
DR180	* 1.0	3.13	* 2	60	4.0	2	7.65	* 0.5	18	49	75	3.70	10	* 1	0.48	20
DR181	7.0	4.31	* 2	120	10.0	* 2	12.92	25.0	18	56	40	5.62	20	* 1	0.05	10
DR182	23.0	1.16	* 2	* 10	12.0	80	>15.00	58.5	11	80	20	0.99	* 10	3	0.02	10
DR183	>200.0	3.61	* 2	30	18.0	650	8.81	36.0	48	102	45	3.73	20	* 1	0.25	20
DR184	1.0	1.89	* 2	10	11.0	4	12.96	2.0	7	76	129	8.24	20	* 1	0.02	10
DR185	0.6	2.15	65	40	>100.0	142	>15.00	2.0	26	26	135	11.76	* 10	* 1	0.18	* 10
DR186	* 1.0	2.74	4	100	7.5	2	0.87	* 0.5	12	95	30	3.93	20	* 1	1.10	40
DR187	2.4	1.65	20	10	7.5	20	>15.00	7.5	13	24	150	>15.00	* 10	5	0.15	* 10
DR188	2.0	3.94	* 2	10	140.5	* 2	13.80	6.0	37	58	388	10.43	20	* 1	0.06	10
DR189	1.0	4.52	* 2	140	4.5	* 2	7.31	4.5	14	58	275	3.96	20	* 1	0.61	10
DR190	24.6	4.69	5	40	28.5	520	8.41	31.0	37	29	>10000	>15.00	20	* 1	0.18	30
DR191	4.0	3.01	54	10	44.5	40	>15.00	5.5	12	4	247	11.95	* 10	* 1	0.15	* 10
DR192	1.0	4.45	56	10	229.0	184	>15.00	8.5	9	68	718	11.54	20	* 1	0.10	10
DR193	3.0	3.17	16	* 10	145.5	226	>15.00	14.5	11	73	639	14.44	20	* 1	0.05	10
DR194	4.0	1.75	* 2	130	46.5	* 2	>15.00	19.5	19	75	724	13.34	10	* 1	0.02	* 10
DR195	1.0	0.37	* 2	* 10	16.0	* 2	10.63	3.5	24	20	51	7.11	10	* 1	* 0.01	* 10
DR196	18.0	1.66	* 2	10	101.5	82	>15.00	74.5	19	74	239	9.50	10	* 1	0.05	10
DR197	2.0	2.36	38	10	20.0	* 10	14.75	2.0	8	* 1	64	9.37	* 10	4	0.01	* 10
DR198	* 1.0	1.28	* 2	* 10	15.0	* 2	>15.00	1.0	4	55	15	>15.00	30	* 1	0.01	* 10
DR199	3.0	1.69	* 2	* 10	252.0	36	>15.00	2.0	29	38	172	12.83	10	* 1	0.02	* 10
DR200	24.4	2.23	30	50	96.0	380	12.43	>100.0	47	38	759	11.09	* 10	8	0.38	* 10
DR201	109.4	2.65	* 5	50	>100.0	642	13.38	>100.0	83	43	582	5.00	* 10	* 1	0.23	* 10
DR202	9.0	3.16	* 2	10	21.5	70	14.12	>100.0	18	50	78	4.51	20	* 1	0.01	20
DR203	5.0	2.99	15	30	>100.0	458	>15.00	81.5	19	29	515	10.18	* 10	* 1	0.41	* 10
DR204	1.0	2.06	40	50	85.0	122	10.09	16.5	13	66	210	3.73	* 10	* 1	0.80	10
DR205	45.0	3.50	* 2	* 10	226.5	572	14.91	>100.0	74	40	426	5.66	20	* 1	0.03	10
DR206	38.4	0.99	* 5	* 10	21.0	636	>15.00	>100.0	34	133	144	1.58	10	* 1	0.04	20
DR207	99.4	1.68	15	20	42.0	1634	2.96	>100.0	221	54	659	3.63	10	* 1	0.10	10
DR208	36.0	0.70	2	* 10	>100.0	505	9.78	>100.0	167	6	276	3.36	* 10	2	* 0.01	* 10
DR209	139.4	1.72	* 5	110	14.5	440	10.39	>100.0	21	43	164	1.60	* 10	13	0.29	* 10
DR210	76.0	0.93	16	30	27.5	315	>15.00	>100.0	20	* 1	2326	2.44	* 10	* 1	0.04	* 10
DR211	8.0	2.64	* 2	* 10	20.0	88	5.96	>100.0	126	39	581	7.52	30	* 1	* 0.01	* 10
DR212	1.0	1.80	* 2	* 10	18.0	38	>15.00	16.5	9	65	48	14.57	40	* 1	* 0.01	* 10
DR213	7.0	1.00	112	* 10	>100.0	75	>15.00	36.5	51	12	182	12.18	* 10	5	0.03	* 10
DR214	109.0	3.59	26	20	65.5	5430	5.95	>100.0	214	9	1062	5.83	20	1	0.17	* 10
DR215	41.4	1.84	* 5	* 10	41.0	558	3.05	>100.0	89	15	300	3.30	20	8	* 0.01	30
DR216	35.4	2.32	* 5	10	82.0	550	11.14	>100.0	59	26	574	7.75	* 10	* 1	0.02	* 10
DR217	17.8	2.36	35	20	>100.0	220	14.82	>100.0	58	41	650	9.47	* 10	* 1	0.05	* 10
DR218	2.0	2.49	* 2	10	36.0	44	8.93	5.0	8	115	159	2.94	20	* 1	0.39	10
DR219	2.0	2.94	66	10	244.0	636	>15.00	11.5	9	55	1295	14.16	30	* 1	0.64	10
DR220	1.0	3.84	12	20	219.0	190	>15.00	8.5	6	82	328	9.30	20	* 1	0.27	10
DR221	3.0	3.49	44	* 10	259.5	320	>15.00	42.0	13	86	916	10.49	20	* 1	0.02	* 10
DR222	2.6	3.32	45	70	>100.0	200	>15.00	43.0	16	48	524	8.07	* 10	* 1	0.32	* 10
DR223	1.0	0.56	* 2	80	31.5	* 2	13.87	8.5	48	23	121	9.64	10	* 1	0.03	* 10
DR224	4.0	0.50	* 2	* 10	12.0	* 2	4.37	5.5	21	17	155	3.84	10	* 1	0.03	* 10
DR225	1.0	5.12	350	10	126.0	392	>15.00	46.5	38	51	639	8.00	20	* 1	0.25	20
DR226	26.0	3.81	* 2	10	10.5	244	2.97	7.5	30	29	40	4.16	30	* 1	0.03	20
DR227	1.0	4.92	* 2	170	4.0	2	2.82	* 0.5	29	146	95	5.91	20	* 1	1.36	10
DR228	2.0	3.40	* 2	40	184.0	450	10.84	91.0	23	19	754	12.98	30	1	2.21	* 10
DR229	7.0	3.64	* 2	* 10	11.0	10	8.97	12.0	8	62	284	4.10	20	3	* 0.01	10
DR230	* 1.0	4.46	18	* 10	3.5	18	6.66	* 0.5	7	98	16	3.83	30	* 1	0.04	20
DR231	7.0	3.64	* 2	* 10	5.5	78	9.39	43.5	23	36	42	3.49	20	3	0.02	10
DR232	8.6	2.54	5	90	13.5	46	13.82	>100.0	33	40	299	2.81	* 10	6	0.61	* 10

no.	Mg (Pct)	Mn (Pct)	Mo (Ppm)	Na (Pct)	Ni (Ppm)	P (Ppm)	Pb (Ppm)	Sb (Ppm)	Sc (Ppm)	Sr (Ppm)	Ti (Pct)	Tl (Ppm)	U (Ppm)	V (Ppm)	W (Ppm)	Zn (Ppm)
DR180	2.51	2095	1	0.12	28	1020	30	4	6	133	0.35	* 10	* 10	55	20	154
DR181	1.10	9325	8	0.02	21	370	882	* 2	4	393	0.05	* 10	20	55	50	2124
DR182	0.35	2365	93	0.01	5	60	1270	* 2	3	132	0.03	* 10	20	33	30	6994
DR183	1.88	5845	10	0.04	38	510	>10000	* 2	10	196	0.22	* 10	20	107	80	>10000
DR184	0.26	5115	3	0.01	4	1710	56	12	4	67	0.12	* 10	10	26	100	736
DR185	1.17	>10000	8	0.23	4	200	134	15	3	31	0.04	* 10	* 10	14	570	1570
DR186	0.70	910	31	0.07	27	370	22	* 2	6	12	0.18	* 10	* 10	54	10	184
DR187	0.40	1285	25	0.19	5	310	102	25	3	78	0.04	* 10	* 10	73	150	1710
DR188	0.89	>10000	27	0.07	18	770	70	6	8	386	0.16	* 10	50	49	410	1358
DR189	1.03	2810	3	0.21	6	1140	60	* 2	9	183	0.39	* 10	* 10	94	30	1202
DR190	0.82	4655	13	0.08	7	400	1928	15	5	299	0.08	* 10	* 10	71	350	>10000
DR191	0.56	7945	8	0.03	9	1140	86	* 2	5	285	0.09	* 10	* 10	54	100	2074
DR192	0.51	7035	10	0.08	6	630	* 2	26	4	34	0.09	* 10	10	32	670	3338
DR193	0.55	7850	1	0.03	11	310	220	10	3	74	0.06	* 10	* 10	36	340	3290
DR194	0.15	>10000	2	0.02	9	340	562	* 2	3	46	0.06	* 10	30	45	190	2080
DR195	0.21	>10000	12	0.10	1	140	118	6	1	46	0.02	* 10	90	19	100	916
DR196	0.47	>10000	28	0.05	3	200	766	* 2	4	99	0.07	* 10	20	28	610	>10000
DR197	0.21	5950	22	0.05	6	130	36	* 2	4	102	0.07	* 10	* 10	17	90	984
DR198	0.10	4885	* 1	0.03	* 1	140	26	8	2	19	0.02	* 10	* 10	20	130	328
DR199	0.69	>10000	18	0.03	4	220	136	6	3	212	0.04	* 10	40	32	500	950
DR200	0.43	>10000	101	0.07	7	290	2784	5	3	132	0.06	* 10	* 10	24	570	>10000
DR201	0.62	>10000	73	0.15	7	590	9358	5	4	256	0.09	* 10	* 10	25	1550	>10000
DR202	0.35	7045	129	0.01	7	290	3366	* 2	5	327	0.13	* 10	20	49	130	>10000
DR203	0.23	7095	11	0.15	* 1	190	290	5	2	25	0.03	* 10	* 10	13	850	>10000
DR204	2.93	3295	1	0.18	2	380	124	5	3	27	0.06	* 10	* 10	26	330	2814
DR205	1.05	>10000	42	0.06	12	370	1704	* 2	2	506	0.04	* 10	30	37	730	>10000
DR206	0.08	2460	30	0.31	5	70	2748	5	2	96	0.03	* 10	30	13	800	>10000
DR207	0.29	>10000	58	0.04	12	1060	8778	5	2	175	0.05	10	20	50	260	>10000
DR208	0.62	>10000	195	0.04	5	1020	1790	* 2	2	113	0.04	* 10	* 10	13	400	>10000
DR209	0.26	3555	182	0.04	* 1	290	>10000	5	3	93	0.05	* 10	* 10	22	250	>10000
DR210	0.36	>10000	17	0.08	2	290	5608	* 2	2	118	0.04	* 10	* 10	10	300	>10000
DR211	1.06	>10000	8	0.02	7	290	402	* 2	2	277	0.07	* 10	20	35	320	>10000
DR212	0.29	5465	2	0.02	2	210	126	4	2	31	0.02	* 10	* 10	26	110	2850
DR213	0.61	>10000	12	0.10	2	290	202	6	2	134	0.01	* 10	* 10	13	250	6416
DR214	0.52	>10000	140	0.03	13	2070	9852	* 2	7	315	0.17	* 10	10	56	250	>10000
DR215	0.93	8810	21	*0.01	11	500	2932	5	2	192	0.04	* 10	* 10	24	140	>10000
DR216	0.70	>10000	35	0.02	5	440	2892	5	3	180	0.09	* 10	* 10	27	380	>10000
DR217	0.59	9880	15	*0.01	11	320	1116	5	4	116	0.07	* 10	* 10	23	300	>10000
DR218	0.60	2200	10	0.06	17	350	46	6	7	23	0.12	* 10	* 10	66	100	924
DR219	2.25	6040	2	0.16	5	90	20	24	4	23	0.06	* 10	* 10	36	660	3840
DR220	0.29	8240	3	0.13	* 1	380	40	24	3	39	0.06	* 10	30	27	590	1652
DR221	0.31	8085	8	0.04	7	390	130	16	3	97	0.02	* 10	10	29	770	6810
DR222	0.46	6195	4	0.08	6	340	140	15	3	42	0.07	* 10	* 10	31	440	6592
DR223	0.47	>10000	13	0.04	3	280	72	* 2	2	165	0.03	* 10	60	33	130	2544
DR224	0.38	>10000	4	0.02	2	260	276	2	1	68	0.03	* 10	30	13	30	1446
DR225	1.16	6995	4	0.06	9	960	36	4	8	25	0.25	* 10	* 10	39	320	8638
DR226	1.85	8130	131	0.01	13	470	>10000	* 2	4	226	0.08	* 10	10	78	70	>10000
DR227	2.32	765	12	0.55	63	1740	100	6	8	123	0.52	* 10	* 10	130	20	444
DR228	9.62	4710	5	0.12	3	220	20	* 2	2	47	0.02	* 10	* 10	30	600	>10000
DR229	0.47	6315	86	0.03	2	470	774	2	2	406	0.21	* 10	10	60	20	2190
DR230	0.32	2725	88	0.04	2	290	170	6	6	446	0.17	* 10	* 10	50	10	186
DR231	1.62	8000	1332	0.03	15	370	3448	4	10	309	0.21	* 10	20	71	40	6716
DR232	4.27	3185	19	0.04	25	750	1796	10	3	120	0.21	* 10	* 10	48	60	>10000

Appendix C. con't.

no.	Ag (Ppm)	Al (Pct)	As (Ppm)	Ba (Ppm)	Be (Ppm)	Bi (Ppm)	Ca (Pct)	Cd (Ppm)	Co (Ppm)	Cr (Ppm)	Cu (Ppm)	Fe (Pct)	Ga (Ppm)	Hg (Ppm)	K (Pct)	La (Ppm)	Mg (Pct)	Mn (Pct)	Mo (Ppm)	Na (Pct)	Ni (Ppm)	P (Ppm)	Pb (Ppm)	Sb (Ppm)	Sc (Ppm)	Sr (Ppm)	Ti (Pct)	Tl (Ppm)	U (Ppm)	V (Ppm)	W (Ppm)	Zn (Ppm)
DR233	2.2	1.86	5	60	22.5	82	12.95	>100.0	38	33	213	3.81	* 10	* 1	0.51	* 10	8.59	3590	6	0.03	15	580	1074	10	3	75	0.16	10	* 10	41	110	>10000
DR234	19.0	5.14	* 2	* 10	35.5	24	10.83	> 10.0	9	88	31	5.01	20	* 1	0.01	20	0.51	>10000	4	0.01	13	380	204	* 2	9	466	0.24	* 10	30	78	60	8784
DR235	96.6	2.59	15	40	59.5	382	9.28	>100.0	78	66	61	2.95	* 10	9	0.08	20	0.37	>10000	460	0.02	12	480	>10000	5	6	130	0.13	* 10	* 10	86	560	>10000
DR236	51.0	4.79	* 2	10	38.5	120	8.97	96.5	17	59	87	5.06	30	* 1	0.01	10	0.43	>10000	52	0.01	8	290	>10000	* 2	7	626	0.17	* 10	30	67	110	>10000
DR237	>200.0	2.12	* 5	10	30.0	850	4.66	>100.0	99	69	98	2.93	10	* 1	* 0.01	40	0.25	>10000	429	*0.01	5	430	>10000	5	4	134	0.11	* 10	* 10	34	200	>10000
DR238	>200.0	2.17	* 5	10	20.5	598	6.16	>100.0	74	40	52	2.28	* 10	* 1	* 0.01	40	0.36	>10000	107	*0.01	8	340	>10000	5	3	156	0.10	* 10	* 10	31	180	>10000
DR239	160.6	2.12	* 5	10	34.0	400	5.13	>100.0	79	55	68	2.73	* 10	* 1	* 0.01	40	0.42	>10000	114	*0.01	13	400	>10000	5	4	151	0.12	* 10	* 10	49	930	>10000
DR240	1.0	2.27	* 2	10	10.0	* 2	2.66	3.0	18	95	759	3.74	20	3	0.04	10	0.96	7615	12	0.04	11	240	196	2	2	160	0.09	* 10	10	32	10	756
DR241	2.0	2.52	* 2	60	80.0	* 2	6.92	2.5	43	61	741	12.49	20	* 1	0.08	10	0.82	>10000	2	0.04	37	580	346	10	4	236	0.14	* 10	40	53	60	822
DR242	6.0	0.85	* 2	10	42.0	* 2	9.29	33.5	21	19	7790	6.29	10	* 1	0.02	* 10	0.77	>10000	1	0.02	* 1	210	86	* 2	1	221	0.01	* 10	20	20	40	4624
DR243	12.0	3.08	* 2	190	87.0	18	5.00	81.5	40	41	1647	9.51	30	* 1	0.07	10	1.15	>10000	16	0.04	13	720	1070	* 2	3	398	0.14	* 10	40	74	80	>10000
DR244	* 1.0	1.67	* 2	20	2.5	12	1.21	0.5	3	321	30	1.86	10	* 1	0.25	20	0.16	375	24	0.07	11	140	16	* 2	2	33	0.04	10	* 10	8	* 10	208
DR245	3.0	2.03	* 2	40	153.5	118	8.17	57.0	12	28	3182	>15.00	20	* 1	1.09	* 10	5.99	>10000	60	0.07	* 1	380	* 2	* 2	9	62	0.07	* 10	30	35	300	>10000
DR246	15.0	3.05	* 2	* 10	3.0	40	13.35	* 0.5	27	80	>10000	10.93	10	* 1	0.01	* 10	2.44	5555	1	0.02	18	600	84	4	6	186	0.18	* 10	10	60	50	330
DR247	* 1.0	1.66	4	30	1.0	* 2	1.56	* 0.5	11	119	304	3.06	* 10	* 1	0.31	10	0.76	630	12	0.10	12	520	46	2	7	30	0.15	* 10	10	43	* 10	164
DR248	* 1.0	1.67	* 2	* 10	5.0	4	10.12	* 0.5	11	51	267	8.27	* 10	10	* 0.01	* 10	1.13	4080	4	0.02	8	660	36	4	3	77	0.13	* 10	* 10	26	60	190
DR249	* 1.0	2.91	* 2	60	4.0	* 2	1.18	* 0.5	11	22	45	3.44	10	7	0.67	10	1.15	720	265	0.01	11	640	18	6	3	23	0.01	* 10	* 10	36	* 10	144
DR250	* 1.0	6.45	* 2	100	2.5	* 2	3.13	0.5	9	38	75	3.55	10	* 1	0.66	10	0.62	1335	7	0.22	11	1130	64	* 2	6	165	0.20	* 10	* 10	38	* 10	158
DR251	93.0	3.73	* 2	30	11.5	180	8.30	79.5	48	166	25	5.78	30	* 1	0.09	10	3.78	8580	11	0.03	71	1180	8936	* 2	11	106	0.22	* 10	20	102	70	>10000
DR252	4.0	1.52	* 2	30	13.5	* 2	4.63	4.5	31	46	2104	13.12	20	* 1	0.10	* 10	1.05	9655	15	0.07	* 1	560	96	6	3	85	0.09	* 10	10	31	100	780
DR253	* 1.0	1.89	* 2	10	6.0	* 2	9.11	0.5	16	43	46	8.59	20	* 1	0.05	* 10	0.84	5540	16	0.03	8	580	70	6	2	135	0.11	* 10	10	31	60	180
DR254	11.0	2.93	* 2	10	17.0	16	6.52	20.5	21	84	1014	5.12	20	* 1	0.08	20	0.79	7620	16	0.07	* 1	860	542	* 2	4	74	0.14	* 10	10	38	40	2770
DR255	* 1.0	3.06	* 2	190	5.5	14	0.84	2.0	9	47	139	3.25	20	* 1	1.11	20	1.36	695	11	0.13	8	600	22	* 2	8	54	0.13	* 10	* 10	47	10	728
DR256	28.2	3.86	10	10	16.0	60	2.76	2.0	64	66	>10000	>15.00	30	* 1	0.04	40	2.22	>10000	25	0.03	12	400	1462	5	4	37	0.11	* 10	* 10	39	< 50	3334
DR257	0.2	3.84	* 5	* 10	10.5	* 2	14.38	1.5	13	62	88	6.11	10	* 1	* 0.01	30	2.13	7040	2	0.02	8	1420	56	5	7	278	0.26	* 10	* 10	59	* 10	446
DR258	28.4	3.92	25	10	17.5	< 20	8.03	4.0	50	59	>10000	>15.00	10	* 1	0.04	30	2.27	>10000	10	0.03	4	< 200	1380	5	6	41	0.14	* 10	* 10	33	< 50	2586
DR259	0.4	2.53	25	20	4.0	* 2	13.77	1.0	21	79	172	11.95	* 10	* 1	0.03	20	0.17	7540	5	0.03	9	160	24	15	4	21	0.10	* 10	* 10	19	* 10	290
DR260	* 1.0	2.48	* 2	40	3.5	* 2	3.35	* 0.5	24	97	58	4.18	20	* 1	0.10	* 10	2.28	1385	1	0.20	46	370	40	6	22	108	0.38	* 10	* 10	157	20	158
DR261	* 1.0	1.62	* 2	20	2.0	10	1.69	* 0.5	20	100	42	3.43	10	* 1	0.13	* 10	1.38	780	3	0.19	36	330	34	2	12	49	0.24	* 10	* 10	110	10	154
DR262	19.0	3.15	* 2	10	4.0	108	3.89	>100.0	55	108	7561	5.63	30	* 1	0.12	10	2.21	2755	11	0.01	12	970	532	* 2	5	164	0.12	* 10	* 10	36	60	>10000
DR263	10.0	2.71	* 2	10	4.0	48	2.49	>100.0	58	142	6748	7.49	30	* 1	0.12	* 10	1.59	1895	8	0.01	8	1220	236	* 2	4	150	0.12	* 10	10	33	30	>10000
DR264	11.0	2.59	* 2	40	6.0	* 2	4.48	18.5	13	103	201	3.21	20	* 1	0.15	10	1.70	2890	7	0.02	11	790	502	* 2	7	165	0.28	* 10	10	61	20	3864
DR265	* 1.0	3.55	* 2	130	4.5	8	4.16	7.0	14	156	295	4.67	10	* 1	0.17	20	0.69	3835	6	0.02	9	650	1092	* 2	10	235	0.30	* 10	20	87	20	2324
DR266	* 1.0	5.12	* 2	190	3.0	12	3.25	4.0	36	76	328	7.42	20	* 1	0.86	60	2.47	1455	* 1	0.11	96	4550	180	* 2	13	219	1.08	* 10	* 10	166	20	1162
DR267	1.6	2.29	* 5	30	2.5	6	13.07	13.5	13	76	154	2.85	* 10	5	0.26	30	1.40	1650	* 1	0.12	19	1140	402	5	6	148	0.38	* 10	* 10	63	* 10	3780
DR268	2.0	2.03	10	40	1.5	8	1.39	8.5	14	116	274	2.41	* 10	* 1	0.19	10	0.79	1740	4	0.06	11	440	882	5	5	85	0.21	* 10	* 10	46	* 10	1840
DR269	* 1.0	0.89	* 2	10	1.0	* 10	0.56	1.0	7	17	126	1.05	10	* 1	0.14	* 10	0.54	360	4	0.03	9	460	36	4	3	16	0.07	* 10	10	23	* 10	512
DR270	2.0	4.47	4	70	4.5	* 10	1.64	4.0	51	119	1347	5.38	40	* 1	1.52	* 10	2.50	990	5	0.12	50	670	64	4	18	86	0.51	* 10	* 10	142	* 10	1156
DR271	3.0	3.37	42	10	8.0	20	2.10	34.0	19	9	837	7.90	20	* 1	0.03	10	1.92	3865	234	0.06	25	460	2310	10	7	99	0.12	* 10	40	33	10	>10000
DR272	2.0	3.01	32	70	4.0	* 10	0.75	20.0	17	28	187	3.97	20	1	0.74	10	1.58	1635	3	0.02	27	530	290	12	10	37	0.26	* 10	* 10	47	* 10	3722
DR273	14.0	3.87	28	* 10	3.0	120	1.00	24.0	122	31	4412	8.63	30	* 1	0.11	20	1.60	2550	43	0.01	26	480	670	6	6	81	0.04	* 10	30	37	* 10	>10000
DR274	12.0	4.07	42	10	22.5	50	0.65	11.5	184	19	1922	>15.00	30	* 1	0.02	20	1.92	2440	277	0.02	13	600	1786	8	6	45	0.04	* 10	50	47	< 50	5350
DR275	44.0	2.21	* 2	130	42.0	100	5.19	>100.0	42	149	>10000	9.80	10	* 1	0.05	10	0.89	>10000	18	0.01	9	1000	>10000	* 2	4	152	0.12	* 10	70	60	300	>10000
DR276	5.0	2.58	* 2	40	2.0	26	5.92	40.5	30	47	2027	3.70	30	* 1	0.24	10	1.56	1930	48	0.01	6	820	170	* 2	4	115	0.03	* 10	* 10	52	30	7992
DR277	4.0	2.31	* 2	40	2.0	28	5.80	17.0	26	40	2079	3.33	20	* 1	0.29	* 10	1.67	1820	82	0.04	9	950	128	2	3	89	0.02	* 10	* 10	48	20	2934
DR278	46.0	3.52	28	* 10	1.0	100	4.83	>100.0	181	75	>10000	4.87	20	* 1	0.32	10	1.83	1855	25	0.06	13	800	2748	* 2	4	211	0.06	* 10	* 10	76	100	>10000
DR279	* 1.0	3.33	* 2	30	2.5	4	6.64	3.0	2	69	22	2.30	10	* 1	0.79	30	1.94	765	19	0.03	6	450	82	4	5	39	0.06	* 10	* 10	42	10	280
DR280	* 1.0	3.03	12	30	2.0	4	11.73	9.0	7	121	56	2.50	* 10	* 1	0.35	10	1.55	595	16	0.02	21	820	334	6	6	74	0.22	* 10	30	59	20	762
DR281	2.0	2.25	6	20	0.5	* 2	>15.00	27.5	1	32	73	1.88	* 10	* 1	0.49	10	1.21	765	5	0.03	4	470	748	* 2	5	97	0.11	* 10	10	34	20	2272
DR282	20.6	2.04	20	10	1.0	114	10.97	>100.0	77	35	>10000	4.59	* 10	* 1	0.10	* 10	1.45	3770	15	0.01	11	560	652	5	3	124	0.05	* 10	* 10	41	50	>10000
DR283	46.6	2.70	20	40	* 0.5	* 2	8.03	26.0	30	30	>10000	4.41	* 10	5	0.09	* 10	1.76	2265	16	0.05	10	540	242	5	3	78	0.04	* 10	* 10	38	* 10	3186
DR284	* 1.0	1.18	* 2	50	1.0	* 10	9.06	20.5	6	10	70	1.75	* 10	1	0.18	* 10	1.21	675	16	0.02	6	460	68	2	3	70	0.05	* 10	* 10	27	* 10	1814
DR285	* 1.0	1.45	6	30	3.0	20	0.34	* 0.5	4	17	22	1.63	10	* 1	0.67	10	0.90	305	8	0.02	7	330	20	4	2	7	0.01	* 10	* 10	9	* 10	152

Appendix C. con't.

no.	Ag (Ppm)	Al (Pct)	As (Ppm)	Ba (Ppm)	Be (Ppm)	Bi (Ppm)	Ca (Pct)	Cd (Ppm)	Co (Ppm)	Cr (Ppm)	Cu (Ppm)	Fe (Pct)	Ga (Ppm)	Hg (Ppm)	K (Pct)	La (Ppm)	Mg (Pct)	Mn (Pct)	Mo (Ppm)	Na (Pct)	Ni (Ppm)	P (Ppm)	Pb (Ppm)	Sb (Ppm)	Sc (Ppm)	Sr (Ppm)	Ti (Pct)	Tl (Ppm)	U (Ppm)	V (Ppm)	W (Ppm)	Zn (Ppm)
DR286	* 1.0	1.52	* 2	10	3.5	* 10	3.67	7.0	5	9	12	1.50	20	1	0.34	40	1.11	970	14	0.02	1	350	66	6	2	30	*0.01	* 10	20	12	* 10	828
DR287	2.0	1.12	16	10	1.0	* 10	>15.00	3.0	8	* 1	34	1.88	* 10	1	0.11	* 10	1.12	2200	42	0.02	7	480	134	6	3	154	0.01	* 10	* 10	32	* 10	634
DR288	* 1.0	1.24	* 2	10	0.5	* 10	>15.00	1.0	6	8	28	1.39	* 10	1	0.07	* 10	1.26	1685	216	0.03	7	350	34	12	3	111	0.01	* 10	* 10	18	* 10	306
DR289	* 1.0	1.29	* 2	10	1.0	* 10	>15.00	1.5	8	15	26	2.21	* 10	1	0.25	* 10	0.99	1490	12	0.03	7	570	58	4	6	89	0.08	* 10	* 10	34	* 10	266
DR290	2.0	2.26	* 2	40	8.0	* 10	2.27	6.5	11	21	125	2.68	20	* 1	0.61	10	1.46	3340	17	0.03	11	940	104	4	8	21	0.08	* 10	* 10	53	* 10	608
DR291	* 1.0	2.41	100	50	2.0	* 10	2.63	1.0	8	22	43	2.46	20	* 1	1.13	* 10	1.77	625	6	0.02	23	280	48	8	5	21	0.13	* 10	* 10	16	* 10	170
DR292	* 1.0	2.47	24	50	3.0	* 10	1.68	1.5	7	* 1	37	2.25	10	1	0.96	10	2.36	1105	8	0.02	2	250	312	4	2	20	0.02	* 10	* 10	10	* 10	550
DR293	50.0	1.32	28	40	1.5	200	>15.00	55.5	27	6	4900	5.13	* 10	* 1	0.19	* 10	1.62	8065	7	0.03	2	240	2704	2	3	119	0.01	* 10	* 10	16	130	7860
DR294	101.0	0.55	26	90	3.5	270	7.02	>100.0	75	1	7441	9.88	10	1	0.07	* 10	1.20	>10000	6	0.03	2	270	7580	* 2	1	67	0.01	* 10	* 10	12	420	>10000
DR295	131.0	1.47	12	60	4.0	466	11.42	>100.0	54	9	5275	9.48	20	* 1	0.04	* 10	0.92	>10000	86	0.03	3	420	>10000	* 2	3	70	0.01	* 10	* 10	52	750	>10000
DR296	18.0	1.41	* 2	30	4.0	* 10	>15.00	7.5	29	1	>10000	6.94	* 10	2	0.01	* 10	1.18	5195	6	0.02	3	400	234	6	3	225	0.08	* 10	* 10	26	< 50	1212
DR297	* 1.0	0.69	* 2	10	0.5	* 10	0.71	1.0	4	12	64	1.10	10	* 1	0.11	10	0.44	375	6	0.03	5	300	20	4	1	49	0.01	* 10	30	7	* 10	194
DR298	1.4	0.96	20	60	* 0.5	26	>15.00	* 0.5	3	23	61	1.84	* 10	3	0.03	* 10	0.64	675	* 1	0.02	3	160	4	40	2	268	0.03	* 10	* 10	20	* 10	244
DR299	1.8	0.55	30	30	3.5	2	3.38	* 0.5	* 1	58	53	0.90	10	10	0.15	30	0.13	235	2	0.06	* 1	10	32	10	1	9	*0.01	10	30	* 1	10	198
DR300	3.0	3.47	* 2	160	5.5	* 2	5.25	50.5	32	85	208	6.38	30	* 1	0.03	* 10	1.89	>10000	6	0.01	40	860	684	* 2	5	187	0.23	* 10	30	55	40	5742
DR301	80.0	2.04	30	80	8.0	188	9.51	>100.0	24	93	63	2.83	* 10	* 1	0.13	* 10	0.56	6810	4	0.07	21	1000	>10000	5	3	106	0.05	* 10	* 10	30	500	>10000
DR302	1.0	0.28	18	20	* 0.5	* 10	>15.00	1.0	1	3	13	0.40	* 10	* 1	0.05	* 10	0.17	325	3	0.03	5	540	38	4	1	137	0.01	* 10	* 10	10	* 10	102
DR303	1.8	0.77	20	250	0.5	* 2	>15.00	1.0	11	79	23	0.51	* 10	6	0.11	* 10	0.16	485	4	0.01	12	550	236	10	1	114	0.03	* 10	* 10	13	* 10	374
DR304	>200.0	1.31	25	230	2.5	484	10.41	>100.0	27	119	35	1.39	* 10	7	0.04	10	0.95	4735	5	*0.01	18	1060	>10000	5	4	83	0.15	* 10	* 10	48	70	>10000
DR305	>200.0	2.77	24	30	2.5	285	14.64	>100.0	18	44	42	2.18	* 10	* 1	0.24	* 10	0.78	5805	121	0.02	17	560	>10000	8	4	144	0.06	* 10	* 10	60	30	>10000
DR306	3.6	2.28	* 5	180	2.0	2	2.39	12.0	13	60	27	1.47	10	* 1	0.48	50	0.45	1460	38	*0.01	12	150	300	10	3	64	0.11	* 10	* 10	23	* 10	2994
DR307	7.0	0.72	10	10	* 0.5	274	>15.00	87.5	25	42	1067	1.06	* 10	* 1	0.06	* 10	0.38	865	7	0.04	14	900	546	* 2	2	150	0.08	* 10	10	26	120	>10000
DR308	25.4	1.85	* 5	* 10	* 0.5	2646	6.35	>100.0	561	82	>10000	5.74	* 10	* 1	* 0.01	* 10	0.11	2670	7	0.01	49	2560	926	5	2	6	0.04	* 10	* 10	36	980	>10000
DR309	49.6	1.64	20	70	* 0.5	2656	>15.00	>100.0	49	62	6516	4.22	* 10	* 1	0.03	* 10	0.59	1900	13	*0.01	37	800	3248	5	3	68	0.12	* 10	* 10	38	370	>10000
DR310	27.0	0.39	* 2	20	* 0.5	2760	>15.00	>100.0	191	14	5522	2.05	* 10	* 1	0.01	* 10	0.46	1395	14	0.02	41	1230	1948	* 2	2	53	0.01	* 10	* 10	13	400	>10000
DR311	4.0	1.75	10	260	* 0.5	* 2	2.20	4.5	23	154	104	2.23	* 10	* 1	0.21	30	0.86	930	7	0.02	59	430	232	5	4	40	0.13	* 10	* 10	34	* 10	1110
DR312	2.0	1.56	132	90	* 0.5	* 10	2.07	2.5	18	47	179	2.45	10	* 1	0.14	* 10	1.05	905	6	0.06	57	570	504	4	4	35	0.08	* 10	40	37	* 10	774
DR313	* 1.0	0.88	6	9370	* 0.5	* 10	4.03	0.5	12	13	124	1.50	20	* 1	0.10	* 10	0.26	680	3	0.07	12	210	212	4	2	77	0.06	10	50	19	* 10	366
DR314	4.8	1.06	50	>10000	* 0.5	66	1.86	4.5	29	92	230	4.26	10	* 1	0.09	40	0.09	125	18	*0.01	44	2910	204	5	1	304	0.02	* 10	* 10	25	20	674
DR315	2.0	2.14	34	90	0.5	* 10	14.17	2.0	2	17	2596	1.07	* 10	1	0.15	* 10	0.15	305	* 1	0.08	6	240	92	4	1	92	0.03	* 10	* 10	9	* 10	132
DR316	1.6	0.83	15	140	* 0.5	* 2	>15.00	1.5	* 1	30	11	0.74	* 10	* 1	0.20	* 10	0.61	1205	1	*0.01	13	2050	94	10	2	105	0.02	* 10	* 10	14	10	280
DR317	2.6	0.66	70	340	0.5	8	0.86	1.5	10	206	37	1.95	* 10	* 1	0.23	10	0.31	215	87	*0.01	3	260	284	5	1	10	*0.01	* 10	* 10	15	* 10	414
DR318	* 1.0	2.26	* 2	130	1.5	* 2	0.32	1.0	6	31	14	1.68	10	2	1.15	20	0.84	260	4	0.01	3	70	58	* 2	3	8	0.03	10	* 10	8	* 10	408
DR319	1.0	4.08	24	80	1.5	14	3.09	2.5	14	42	44	2.93	* 10	* 1	0.43	* 10	1.88	1625	6	0.44	14	910	50	* 2	7	154	0.46	* 10	10	86	10	996
DR320	42.0	2.50	* 2	40	1.0	922	2.85	>100.0	113	42	622	5.20	* 10	1	0.29	* 10	1.95	1845	19	0.13	18	1120	1348	* 2	5	86	0.29	* 10	* 10	77	150	>10000
DR321	23.8	2.00	* 5	200	1.0	66	4.04	67.5	29	109	777	2.63	* 10	* 1	0.29	40	1.00	1425	4	0.02	24	530	1138	5	4	65	0.10	* 10	* 10	36	10	>10000
DR322	35.0	1.01	* 2	80	0.5	56	3.24	>100.0	46	156	217	1.94	10	* 1	0.16	10	0.45	975	97	0.01	11	830	1986	* 2	2	36	0.01	* 10	* 10	18	70	>10000
DR323	141.8	1.91	40	1050	* 0.5	476	6.04	>100.0	161	47	2375	4.16	* 10	* 1	0.24	40	0.89	2620	61	*0.01	24	730	4234	5	2	84	0.02	* 10	* 10	27	200	>10000
DR324	* 1.0	1.72	* 2	120	2.0	* 2	12.07	0.5	5	135	33	2.66	* 10	* 1	0.42	10	0.46	1905	4	0.02	9	390	74	2	4	108	0.06	* 10	10	22	10	166
DR325	7.0	2.54	12	640	6.0	* 2	11.42	12.5	12	67	231	9.03	10	* 1	0.02	10	0.55	7660	19	0.02	10	530	1036	2	4	138	0.10	* 10	30	32	40	3276
DR326	5.6	1.99	* 5	1320	* 0.5	10	1.75	11.0	21	104	406	11.60	* 10	* 1	0.12	30	0.49	1250	13	*0.01	11	470	544	5	2	49	0.03	* 10	* 10	21	30	2628
DR327	1.0	3.27	8	110	* 0.5	8	8.03	1.5	28	212	81	3.49	* 10	1	0.98	* 10	4.07	455	3	0.04	126	870	76	12	7	67	0.33	* 10	* 10	78	* 10	188
DR328	2.0	3.88	* 2	150	* 0.5	12	3.98	5.0	34	206	444	3.62	10	* 1	0.48	* 10	2.32	1585	21	0.30	120	1140	182	12	6	133	0.45	* 10	* 10	83	* 10	1232
DR329	8.8	1.45	* 5	90	2.0	< 20	>15.00	>100.0	19	66	>10000	0.88	* 10	* 1	0.17	* 10	0.27	2060	3	0.01	15	400	50	10	3	91	*0.01	* 10	* 10	19	60	>10000
DR330	2.4	0.60	15	220	0.5	* 2	>15.00	89.5	7	25	413	0.65	* 10	* 1	0.08	* 10	0.17	1725	3	0.01	10	250	110	35	2	119	*0.01	* 10	* 10	11	30	8718
DR331	22.6	2.64	20	310	4.5	< 20	1.44	>100.0	52	123	>10000	1.98	20	* 1	0.13	100	0.51	>10000	* 1	0.02	22	400	1490	5	5	29	*0.01	* 10	* 10	37	40	>10000
DR332	1.4	1.78	* 5	100	0.5	* 2	1.36	2.0	13	159	100	0.93	10	9	0.27	40	0.17	245	5	*0.01	12	80	74	5	2	18	0.02	* 10	10	12	* 10	232
DR333	65.6	1.47	15	140	5.5	100	1.11	>100.0	82	58	>10000	3.02	* 10	6	0.11	30	0.32	>10000	11	*0.01	19	400	8680	5	4	23	0.02	* 10	* 10	19	150	>10000
DR334	3.6	1.56	* 5	100	0.5	6	4.74	14.5	12	164	3303	1.14	* 10	* 1	0.22	50	0.23	1470	14	*0.01	11	180	414	10	2	56	0.04	* 10	* 10	15	10	1802
DR335	30.4	0.09	65	10	* 0.5	4	>15.00	22.5	* 1	50	91	0.57	* 10	* 1	* 0.01	* 10	0.23	640	12	*0.01	4	80	1244	30	* 1	125	*0.01	* 10	* 10	6	* 10	1256
DR336	51.2	0.12	110	10	* 0.5	4	>15.00	41.0	* 1	78	97	0.85	* 10	5	0.02	* 10	0.21	640	16	*0.01	6	80	1690	30	* 1	100	*0.01	* 10	* 10	11	* 10	2040
DR337	11.0	0.23	232	30	* 0.5	12	0.76	21.0	4	286	154	2.49	* 10	* 1	0.06	* 10	0.08	1190	18	0.01	14	180	370	4	* 1	67	*0.01	10	* 10	15	* 10	3304
DR338	7.0	1.03	1510	180	* 0.5	* 2	5.01	* 0.5	7	143	117	10.88	10	* 1	0.59	20	0.09	3745	11	0.02	31	850	100	30	2	311	*0.01	* 10	* 10	42	* 10	166

Appendix C. con't.

no.	Ag (Ppm)	Al (Pct)	As (Ppm)	Ba (Ppm)	Be (Ppm)	Bi (Ppm)	Ca (Pct)	Cd (Ppm)	Co (Ppm)	Cr (Ppm)	Cu (Ppm)	Fe (Pct)	Ga (Ppm)	Hg (Ppm)	K (Pct)	La (Ppm)	Mg (Pct)	Mn (Pct)	Mo (Ppm)	Na (Pct)	Ni (Ppm)	P (Ppm)	Pb (Ppm)	Sb (Ppm)	Sc (Ppm)	Sr (Ppm)	Ti (Pct)	Tl (Ppm)	U (Ppm)	V (Ppm)	W (Ppm)	Zn (Ppm)
DR339	5.0	1.07	958	80	0.5	16	4.26	16.5	13	110	144	7.07	*10	*1	0.49	*10	0.11	4080	8	0.02	21	430	188	10	1	94	*0.01	*10	*10	37	*10	2520
DR340	3.2	0.43	635	150	*0.5	*2	11.42	2.0	4	143	471	4.66	*10	2	0.18	*10	0.11	5370	9	0.01	18	400	120	5	1	204	*0.01	*10	*10	17	10	386
DR341	1.2	0.11	*5	20	*0.5	*2	0.70	2.0	*1	240	82	0.51	*10	14	*0.01	10	0.04	250	8	*0.01	7	50	60	5	*1	4	*0.01	*10	*10	4	*10	172
DR342	40.0	0.50	365	60	*0.5	588	0.53	24.0	9	18	1526	>15.00	*10	*1	*0.01	10	0.11	300	409	*0.01	*1	210	2254	35	3	53	*0.01	*10	*10	44	200	3124
DR343	8.6	5.57	10	140	1.5	20	6.30	3.5	33	172	103	5.68	*10	*1	0.16	30	4.69	1460	*1	0.02	128	850	450	10	17	43	0.32	*10	*10	149	*10	1674
DR344	74.6	1.91	15	60	*0.5	4	>15.00	57.5	22	59	205	2.44	*10	5	0.06	*10	1.81	1885	8	0.02	51	370	1970	80	6	196	0.17	*10	*10	63	*10	1544
DR345	12.0	1.28	*2	10	1.0	44	11.05	>100.0	9	46	46	1.54	*10	3	0.04	*10	3.88	4850	42	0.02	11	380	850	*2	2	60	0.11	*10	20	26	80	>10000
DR346	3.0	2.39	*2	130	0.5	12	3.27	26.5	14	130	153	2.92	10	1	0.54	10	2.27	1090	6	0.18	34	1050	168	*2	9	74	0.49	*10	10	116	20	3802
DR347	18.0	2.70	*2	40	1.0	854	5.46	>100.0	76	56	296	3.54	10	*1	*0.01	10	2.57	7495	9	0.02	21	510	1204	*2	3	34	0.12	*10	30	79	230	>10000
DR348	88.0	0.24	30	*10	*0.5	20	7.93	>100.0	3	101	3316	3.90	*10	*1	0.02	*10	3.90	820	28	0.01	6	130	>10000	*2	1	109	*0.01	*10	10	20	350	>10000
DR349	2.2	4.67	20	30	1.0	12	3.78	3.5	9	28	50	0.92	*10	*1	0.47	30	1.53	280	*1	0.26	12	190	198	10	2	133	0.28	*10	*10	34	*10	720
DR350	7.0	5.53	*2	1040	1.0	*2	5.45	*0.5	21	46	42	4.26	10	6	3.29	10	4.04	600	3	0.04	24	1300	130	*2	12	40	0.30	*10	*10	112	20	560
DR351	55.0	0.42	22	20	*0.5	*2	>15.00	82.0	1	62	435	1.85	*10	3	0.06	*10	7.68	2480	10	0.02	6	50	1920	14	1	82	*0.01	*10	10	14	40	5450
DR352	115.0	0.68	*2	30	*0.5	22	>15.00	94.5	3	66	356	1.16	*10	*1	0.12	*10	6.95	1560	9	0.02	5	100	3702	14	1	111	0.01	*10	10	17	30	5682
DR353	*1.0	0.09	*2	110	1.0	*2	>15.00	1.5	3	13	15	0.24	*10	*1	0.02	*10	0.13	6595	4	0.02	*1	30	32	8	*1	300	*0.01	*10	20	12	30	146
DR354	2.2	1.21	35	80	0.5	8	5.26	0.5	4	272	73	1.37	10	*1	0.23	30	0.61	315	2	0.01	23	440	60	5	3	62	0.01	*10	*10	22	*10	166
DR355	83.6	0.35	25	*10	2.0	226	>15.00	>100.0	27	26	1417	4.90	*10	*1	0.03	20	0.18	>10000	18	0.03	1	*10	>10000	5	1	114	0.01	*10	20	8	100	>10000
DR356	60.8	0.29	5	10	1.5	148	>15.00	97.0	15	61	5270	3.93	*10	*1	0.04	20	0.12	>10000	37	0.03	1	*10	>10000	5	1	153	*0.01	*10	*10	10	*10	>10000
DR358	27.8	1.26	30	110	5.0	92	8.28	>100.0	43	145	648	6.21	10	*1	0.28	20	0.22	>10000	35	0.04	11	*10	>10000	5	2	104	0.03	*10	10	18	100	>10000
DR357	49.4	1.05	*5	80	2.0	124	6.28	>100.0	26	132	5029	3.93	10	*1	0.16	20	0.15	5700	80	0.03	11	*10	3634	5	1	93	0.01	*10	10	13	*10	>10000
DR359	14.4	1.99	30	120	8.0	12	6.20	55.0	13	97	459	3.95	*10	*1	0.38	30	0.23	7405	19	*0.01	18	130	2810	5	2	106	0.06	*10	*10	25	50	4188
DR360	54.0	0.58	*2	30	8.0	150	1.59	>100.0	44	73	2007	6.57	*10	*1	0.05	10	0.40	>10000	162	0.01	10	320	6108	*2	*1	47	0.01	*10	*10	6	140	>10000
DR361	118.0	0.54	*5	170	7.5	314	7.74	>100.0	40	60	3214	7.07	10	*1	*0.01	10	0.20	>10000	83	0.03	*1	*10	>10000	5	1	89	0.03	20	10	17	60	>10000
DR362	114.4	1.08	40	20	5.0	322	10.09	>100.0	47	34	3026	6.37	*10	*1	*0.01	10	0.38	>10000	46	*0.01	6	250	>10000	5	2	133	0.07	*10	*10	14	170	>10000
DR363	52.0	1.02	14	10	12.5	168	7.24	>100.0	77	25	4305	9.41	*10	2	0.02	*10	0.49	>10000	57	0.02	18	410	2826	*2	1	85	0.01	*10	*10	15	290	>10000
DR364	2.0	3.65	10	170	3.0	*2	1.07	2.0	19	35	77	5.09	10	5	0.56	50	0.64	860	11	0.01	17	640	96	5	6	48	0.02	*10	*10	37	*10	142
DR365	2.0	1.20	*2	110	0.5	12	0.21	*0.5	25	250	814	1.35	*10	*1	0.34	10	0.58	535	18	0.01	9	170	108	4	1	8	*0.01	*10	10	81	*10	92
DR366	5.8	0.56	*5	60	*0.5	*2	0.40	2.5	3	152	233	0.80	20	*1	0.25	10	0.07	500	6	*0.01	11	90	88	5	1	7	*0.01	*10	*10	5	*10	498
DR367	2.8	3.00	10	60	0.5	14	0.84	1.0	8	59	143	4.23	20	4	0.57	40	0.75	1530	20	0.02	14	900	350	15	4	25	*0.01	*10	*10	27	*10	324
DR368	8.6	2.37	*5	220	2.0	14	2.45	27.5	14	102	3111	2.71	20	*1	0.62	50	0.59	1485	348	0.02	21	400	8832	5	5	57	0.08	*10	*10	29	*10	4294
DR369	*1.0	0.83	*2	30	1.0	*2	0.16	*0.5	2	81	39	0.73	10	*1	0.21	10	0.08	170	4	0.04	4	40	20	*2	*1	11	*0.01	40	*10	2	*10	160
DR370	3.0	2.70	26	300	2.0	6	0.47	8.5	10	91	114	3.51	20	*1	0.76	30	0.33	1265	7	0.02	18	410	52	*2	4	14	0.05	50	*10	21	10	3326
DR371	1.0	2.37	42	220	2.0	4	0.33	5.0	9	134	94	3.04	10	1	0.71	20	0.38	830	15	0.02	17	210	48	*2	3	10	0.01	40	*10	18	*10	1806
DR372	115.2	0.98	105	20	*0.5	58	7.78	11.0	117	136	9388	2.38	*10	*1	*0.01	20	0.79	1900	11	*0.01	13	220	76	15	1	42	*0.01	*10	*10	24	10	2714
DR373	9.0	1.66	38	470	1.0	12	0.78	0.5	4	101	232	2.90	10	*1	0.40	30	0.40	1105	7	0.02	7	3080	66	*2	2	11	0.02	30	*10	13	*10	724
DR374	>200.0	3.34	45	30	*0.5	80	0.38	15.0	68	125	>10000	13.82	20	1	0.04	20	2.10	9875	24	*0.01	23	800	566	5	5	10	0.09	*10	*10	55	40	>10000
DR375	50.2	2.47	45	30	*0.5	122	13.70	36.5	48	84	4091	>15.00	*10	*1	0.06	*10	1.79	4965	6	0.01	23	560	102	40	5	89	0.08	*10	*10	46	50	6138
DR376	114.0	0.44	40	*10	1.0	60	9.74	>100.0	58	127	1095	13.62	*10	2	0.01	*10	0.38	9145	13	0.03	9	310	50	*2	1	50	*0.01	*10	10	12	200	>10000
DR377	16.0	1.31	38	60	1.5	22	>15.00	15.5	19	59	712	2.86	*10	*1	0.04	*10	1.15	5775	7	0.02	9	160	92	8	3	130	0.02	*10	*10	17	20	3614
DR378	33.0	0.57	32	*10	*0.5	26	0.57	7.5	26	170	3096	>15.00	10	*1	0.01	10	0.17	955	10	0.01	11	*10	54	2	3	4	*0.01	*10	30	16	150	2654
DR379	155.8	0.97	15	20	*0.5	238	>15.00	61.5	41	63	8596	>15.00	*10	*1	0.03	*10	0.61	5350	6	0.01	9	360	178	20	3	104	0.02	*10	*10	25	100	>10000
DR380	59.6	0.44	20	10	*0.5	120	3.69	97.0	21	139	>10000	>15.00	*10	*1	*0.01	*10	0.31	5360	*1	0.02	7	260	346	*2	2	23	0.01	*10	*10	10	200	>10000
DR381	58.4	3.36	25	10	*0.5	800	0.23	30.0	73	32	>10000	>15.00	20	*1	0.03	10	2.49	3860	*1	0.01	12	800	332	20	9	10	0.09	*10	30	69	150	>10000
DR382	21.2	4.01	55	50	*0.5	76	11.03	36.0	43	172	4641	>15.00	10	*1	0.02	*10	2.25	>10000	*1	*0.01	39	500	494	20	9	42	0.24	*10	*10	73	< 50	4544
DR383	17.0	1.82	30	50	1.0	72	10.78	21.5	41	42	921	11.55	*10	2	0.05	*10	2.06	>10000	*1	0.02	2	620	690	25	3	76	0.08	*10	*10	39	80	4180
DR384	17.4	4.66	24	90	*0.5	140	12.51	>100.0	39	53	1318	9.61	*10	*1	0.04	*10	3.38	6365	3	0.01	18	860	328	*2	7	60	0.06	*10	*10	33	70	>10000
DR385	>200.0	0.39	18	10	*0.5	7740	0.21	>100.0	82	24	>10000	>15.00	*10	*1	0.01	*10	0.09	575	*1	0.01	12	330	366	*2	4	2	*0.01	*10	20	2	700	>10000
DR386	169.6	0.57	2	*10	*0.5	298	2.96	>100.0	54	276	>10000	6.08	*10	*1	*0.01	*10	0.21	7865	*1	0.01	10	480	142	*2	2	21	*0.01	*10	*10	22	140	>10000
DR387	1.4	2.48	4	60	3.5	4	5.48	3.5	3	25	129	0.81	*10	*1	0.08	*10	0.42	1225	1	0.07	*1	*10	38	6	1	49	*0.01	*10	*10	*1	*10	1822
DR388	1.6	0.37	*2	10	*0.5	6	>15.00	3.0	3	11	147	0.27	*10	*1	0.02	*10	0.18	1300	*1	0.03	1	*10	18	8	*1	168	*0.01	*10	*10	3	*10	672
DR389	29.2	2.16	26	70	*0.5	64	>15.00	18.5	14	61	1642	13.65	*10	*1	0.09	*10	1.63	>10000	*1	0.02	11	220	798	*2	5	112	0.11	*10	*10	38	140	2654
DR390	131.0	0.27	4	30	*0.5	372	8.28	>100.0	34	132	5466	>15.00	*10	1	*0.01	*10	0.94	>10000	*1	0.02	5	190	3578	*2	1	63	0.01	*10	*10	*1	150	>10000
DR391	1.0	1.97	*2	60	*0.5	2	11.22	*0.5	12	229	64	3.61	*10	*1	0.47	*10	0.51	2740	*1	0.02	5	350	34	4	3	74	0.04	*10	*10	17	10	490

Appendix C. con't.

no.	Ag (Ppm)	Al (Pct)	As (Ppm)	Ba (Ppm)	Be (Ppm)	Bi (Ppm)	Ca (Pct)	Cd (Ppm)	Co (Ppm)	Cr (Ppm)	Cu (Ppm)	Fe (Pct)	Ga (Ppm)	Hg (Ppm)	K (Pct)	La (Ppm)	Mg (Pct)	Mn (Pct)	Mo (Ppm)	Na (Pct)	Ni (Ppm)	P (Ppm)	Pb (Ppm)	Sb (Ppm)	Sc (Ppm)	Sr (Ppm)	Ti (Pct)	Tl (Ppm)	U (Ppm)	V (Ppm)	W (Ppm)	Zn (Ppm)
DR392	2.8	4.21	2	20	*0.5	*2	8.37	4.0	18	42	31	7.84	*10	1	0.08	*10	3.94	6625	*1	0.01	11	690	52	6	8	89	0.16	*10	*10	63	40	1172
DR393	8.8	2.21	*2	370	*0.5	78	>15.00	4.0	14	33	40	4.88	*10	*1	0.15	*10	2.46	9590	6	0.02	7	400	228	8	4	151	0.09	*10	*10	35	20	1074
DR394	13.2	0.70	*2	10	*0.5	32	>15.00	14.0	15	65	892	12.66	*10	1	0.07	*10	1.29	>10000	*1	0.02	9	130	320	2	2	99	0.02	*10	*10	20	90	2262
DR395	25.4	0.34	16	10	*0.5	30	10.29	9.0	13	75	4383	>15.00	*10	1	0.02	*10	0.37	>10000	*1	0.02	3	100	204	*2	2	75	*0.01	*10	10	*1	100	1304
DR396	38.8	0.35	*2	10	*0.5	336	6.26	16.5	23	138	1464	>15.00	*10	2	0.01	*10	0.47	8520	*1	0.02	9	170	406	*2	2	55	*0.01	*10	20	*1	100	2714
DR397	6.6	1.25	12	10	*0.5	12	>15.00	10.0	22	46	439	14.64	*10	1	0.01	*10	1.01	>10000	*1	0.02	12	120	60	*2	3	137	0.04	*10	*10	41	80	2420
DR398	>200.0	5.08	10	*10	*0.5	74	5.65	40.0	23	46	5355	8.71	*10	*1	0.02	50	3.59	>10000	34	0.02	5	1480	4012	2	19	208	0.54	*10	*10	98	60	6764
DR399	33.6	0.88	20	10	*0.5	152	5.72	12.0	29	61	5528	>15.00	*10	*1	0.01	*10	0.55	6660	7	0.02	8	170	514	*2	3	40	0.02	*10	10	2	250	2214
DR400	7.0	1.00	18	20	2.5	24	13.38	8.5	21	94	73	>15.00	*10	1	0.02	*10	1.40	>10000	*1	0.02	6	200	234	2	3	107	0.05	*10	*10	19	50	2178
DR401	12.0	0.73	*2	*10	*0.5	26	>15.00	23.0	23	99	59	>15.00	*10	1	0.01	*10	1.19	>10000	*1	0.03	3	190	224	*2	2	113	0.02	*10	10	19	50	4138
DR402	18.4	0.44	6	50	*0.5	68	>15.00	18.0	14	65	157	14.45	*10	1	0.03	*10	0.63	>10000	*1	0.02	5	150	392	4	1	74	*0.01	*10	*10	8	150	3012
DR403	12.6	2.68	16	130	*0.5	40	12.48	9.0	22	83	672	12.21	*10	2	0.15	*10	1.64	9640	*1	0.02	13	560	484	6	6	110	0.17	*10	*10	20	70	1704
DR404	57.4	1.82	5	180	1.0	190	10.11	46.0	47	46	5618	14.15	10	8	0.16	*10	1.02	6730	8	0.02	10	500	542	30	4	66	0.04	*10	10	36	120	10000
DR405	3.0	5.19	30	120	*0.5	22	0.41	4.5	15	109	300	12.27	20	1	0.71	20	1.51	1620	4	0.01	14	620	38	5	30	24	0.44	*10	*10	249	*10	1182
DR406	3.4	0.86	18	230	0.5	6	2.74	0.5	11	30	300	2.13	*10	*1	0.22	20	0.29	1050	*1	0.02	12	210	48	4	2	28	*0.01	*10	*10	8	*10	782
DR407	4.0	1.09	8	190	0.5	*2	4.03	26.5	10	86	524	2.07	*10	*1	0.30	20	0.35	1160	2	0.02	10	200	36	2	2	22	0.02	*10	*10	8	20	7934
DR408	8.6	1.30	14	130	1.0	18	4.77	4.5	9	94	906	2.47	*10	*1	0.33	10	0.49	1200	6	0.02	7	180	34	4	2	36	0.02	*10	*10	10	10	1254
DR409	4.6	3.01	24	120	*0.5	10	>15.00	11.0	18	34	83	3.86	*10	*1	0.67	*10	1.71	2650	*1	0.03	8	490	1232	14	11	94	0.18	*10	*10	84	10	2540
DR410	2.2	3.56	42	550	2.5	*2	8.04	10.5	11	103	195	2.73	*10	2	1.32	*10	0.52	1190	*1	0.06	14	140	442	12	7	30	0.07	*10	*10	31	*10	1488
DR411	3.2	1.72	10	290	0.5	*2	>15.00	7.5	6	70	267	2.41	*10	*1	0.47	*10	0.36	2885	2	0.02	3	80	104	8	2	105	0.03	*10	*10	15	60	998
DR412	17.4	0.37	36	20	*0.5	62	>15.00	15.0	11	42	66	12.79	*10	1	0.07	*10	0.23	>10000	10	0.03	3	70	566	6	1	114	*0.01	*10	10	3	120	2786
DR413	4.8	1.91	24	230	*0.5	10	>15.00	33.5	13	77	147	3.81	*10	*1	0.46	*10	0.71	3440	*1	0.03	9	240	76	6	3	130	0.04	*10	*10	19	30	6848
DR414	1.0	1.36	22	30	2.5	4	1.32	*0.5	2	126	45	0.81	10	*1	0.28	20	0.25	535	9	0.12	7	20	50	4	1	15	*0.01	*10	*10	1	*10	140
DR415	1.6	1.03	26	120	*0.5	*2	10.47	5.5	8	141	157	1.70	*10	*1	0.29	*10	0.28	1125	2	0.02	11	150	96	6	1	77	*0.01	*10	*10	8	*10	740
DR416	5.4	2.52	40	20	4.5	14	9.52	17.5	25	149	63	>15.00	*10	*1	*0.01	20	2.37	8270	10	0.04	28	460	128	15	6	59	0.07	*10	10	57	<50	2962
DR417	40.6	0.26	15	10	5.0	292	14.42	12.0	20	62	53	>15.00	*10	*1	0.01	20	0.46	>10000	11	0.03	*1	170	566	5	1	112	*0.01	*10	*10	14	<50	2604
DR418	8.0	0.12	75	10	6.5	68	8.42	3.5	21	62	60	>15.00	*10	*1	0.02	10	0.26	9970	24	0.03	3	*10	110	15	2	67	*0.01	*10	*10	*1	<50	490
DR419	13.4	0.71	14	*10	*0.5	34	11.77	2.0	12	67	15	>15.00	*10	*1	0.01	*10	1.22	8695	*1	0.02	10	150	488	4	2	85	0.03	*10	*10	13	50	908
DR420	29.2	0.56	8	20	*0.5	74	7.93	15.0	24	155	6329	>15.00	*10	*1	0.02	*10	0.96	>10000	*1	0.02	14	220	514	2	2	76	0.01	*10	10	8	100	1912
DR421	3.4	0.65	4	*10	*0.5	6	>15.00	4.0	14	40	15	13.10	*10	*1	*0.01	*10	0.76	>10000	1	0.02	10	150	164	4	1	116	0.02	*10	*10	4	90	770
DR422	1.2	1.61	14	10	2.5	8	1.58	*0.5	2	110	11	1.04	10	*1	0.36	10	0.27	925	13	0.11	4	10	42	8	2	13	*0.01	*10	*10	*1	*10	42
DR423	5.4	2.68	28	30	*0.5	4	8.77	5.5	32	103	25	>15.00	*10	*1	0.06	*10	2.68	>10000	*1	0.02	33	700	76	4	7	50	0.19	*10	*10	49	150	1144
DR424	3.0	0.27	45	*10	3.5	*2	6.64	0.5	80	67	53	>15.00	*10	*1	*0.01	10	1.57	8675	12	0.04	*1	*10	88	5	1	52	*0.01	*10	*10	5	<50	310
DR425	2.2	0.14	15	*10	3.5	18	8.64	1.5	37	135	69	>15.00	*10	*1	0.02	10	0.61	>10000	17	0.03	*1	*10	84	5	1	75	*0.01	*10	*10	1	<50	188
DR426	12.6	0.89	30	100	2.0	48	11.71	18.0	9	50	72	7.41	*10	*1	0.02	20	1.07	>10000	4	0.04	*1	300	474	5	1	72	0.06	*10	*10	14	10	2006
DR427	5.6	2.55	48	260	*0.5	8	7.24	5.5	19	77	565	6.47	*10	*1	0.92	*10	0.77	3855	1	0.04	6	620	102	4	4	42	0.02	*10	*10	38	30	1950
DR428	5.0	1.94	22	40	*0.5	6	10.62	9.0	23	91	223	13.09	*10	1	0.08	*10	1.35	9150	*1	0.01	11	450	124	4	5	112	0.08	*10	*10	37	100	1650
DR429	2.2	2.20	20	160	1.5	10	2.64	5.5	36	128	79	6.46	*10	*1	0.88	20	0.69	1575	9	0.04	*1	1660	70	5	3	49	0.03	*10	10	32	*10	1038
DR430	2.4	2.10	30	1410	2.5	10	2.02	7.5	41	55	75	7.55	10	*1	0.69	20	0.80	1115	8	0.04	*1	1320	414	5	3	56	0.01	*10	20	35	*10	1246
DR431	5.6	1.75	5	200	1.0	14	2.32	11.5	21	100	113	4.55	10	4	0.88	10	0.31	1260	7	0.04	*1	1260	326	5	2	37	0.01	10	*10	20	*10	1524
DR432	4.6	3.14	25	310	1.0	*2	6.53	5.5	34	68	101	7.43	10	*1	0.70	20	1.38	3845	7	0.03	18	480	230	5	4	47	0.04	*10	10	35	*10	1064
DR433	0.6	1.68	25	40	2.5	56	0.96	3.5	110	60	199	>15.00	*10	1	0.26	*10	0.64	2150	17	0.03	7	220	36	5	3	24	0.10	*10	*10	17	<50	578
DR434	62.4	1.43	85	90	0.5	168	10.94	90.0	57	54	5275	12.12	*10	*1	0.18	*10	0.75	6265	4	0.02	12	460	426	30	3	78	0.03	10	20	34	110	>10000
DR435	83.6	0.56	*5	20	1.5	500	8.36	82.5	31	60	>10000	>15.00	10	9	0.03	*10	0.70	>10000	*1	0.02	2	200	2312	35	2	71	0.01	*10	*10	17	150	8946
DR436	38.6	1.16	*5	50	*0.5	22	1.47	3.5	85	24	7827	>15.00	10	*1	0.07	20	0.70	5780	9	0.02	7	360	56	5	4	28	0.08	*10	*10	43	100	>10000
DR437	7.6	0.96	*5	130	*0.5	46	0.30	6.5	9	26	810	1.59	10	1	0.04	10	0.08	270	*1	0.02	3	320	156	5	1	44	0.01	*10	*10	7	*10	1454
DR438	172.4	1.56	*5	20	*0.5	720	4.15	>100.0	66	48	>10000	>15.00	10	*1	0.02	20	0.84	6540	22	0.02	11	400	1128	25	4	32	0.04	*10	*10	36	250	>10000
DR439	31.8	0.96	65	40	*0.5	18	1.58	1.0	78	33	6493	>15.00	10	*1	0.06	20	0.78	5995	2	0.01	11	400	156	10	4	23	0.08	*10	*10	40	50	>10000
DR440	25.8	0.91	*5	50	*0.5	24	1.64	2.5	61	29	5371	>15.00	*10	*1	*0.01	20	0.83	6180	9	0.01	11	450	372	5	4	29	0.07	*10	*10	39	50	>10000
DR441	3.6	0.65	45	20	*0.5	2	0.24	*0.5	2	78	268	1.01	10	1	0.11	10	0.18	220	3	0.02	1	20	180	5	*1	8	*0.01	*10	*10	8	10	952
DR442	11.2	0.52	*5	40	*0.5	2	0.44	10.5	*1	193	104	0.82	*10	9	0.20	10	0.14	140	1	*0.01	4	150	1852	5	*1	15	*0.01	*10	*10	9	*10	1240
DR443	1.2	0.73	10	50	*0.5	*2	4.91	3.5	13	159	39	1.13	*10	*1	0.21	30	1.24	760	2	*0.01	11	100	160	10	1	17	*0.01	*10	10	12	*10	184
DR444	>200.0	0.33	5	30	*0.5	*2	>15.00	>100.0	16	16	2048	0.76	*10	*1	0.01	*10	2.45	1290	4	*0.01	13	30	>10000	215	1	391	*0.01	*10	20	31	30	>10000

Appendix C. con't.

no.	Ag (Ppm)	Al (Pct)	As (Ppm)	Ba (Ppm)	Be (Ppm)	Bi (Ppm)	Ca (Pct)	Cd (Ppm)	Co (Ppm)	Cr (Ppm)	Cu (Ppm)	Fe (Pct)	Ga (Ppm)	Hg (Ppm)	K (Pct)	La (Ppm)
DR445	* 0.2	0.70	10	30	0.5	* 2	>15.00	13.5	14	5	41	0.59	* 10	* 1	0.22	* 10
DR446	0.4	0.45	* 5	40	0.5	14	>15.00	14.5	15	10	29	1.15	* 10	* 1	0.14	* 10
DR447	>200.0	0.50	10	30	0.5	36	7.54	>100.0	30	37	4353	3.09	* 10	* 1	* 0.01	20
DR448	5.0	0.38	* 5	80	0.5	* 2	>15.00	40.5	11	18	248	0.84	* 10	3	0.01	* 10
DR449	1.8	4.37	* 5	70	1.0	* 2	6.53	8.0	11	43	127	1.28	* 10	* 1	0.62	30
DR450	* 1.0	2.09	36	* 10	* 0.5	* 10	10.72	* 0.5	1	39	146	1.04	* 10	* 1	0.11	10
DR451	1.8	1.95	20	50	0.5	* 2	13.11	10.5	25	50	1282	1.80	* 10	4	0.23	* 10
DR452	* 1.0	5.13	14	50	1.0	* 10	6.20	* 0.5	4	45	266	1.67	* 10	* 1	0.87	10
DR453	2.0	4.64	* 5	60	1.5	* 2	5.26	7.0	13	40	138	1.15	* 10	* 1	0.59	40
DR454	* 1.0	1.93	* 2	20	* 0.5	* 10	10.55	* 0.5	2	33	60	1.06	* 10	* 1	0.25	* 10
DR455	* 1.0	2.43	84	90	0.5	* 10	8.83	4.0	3	36	65	1.46	* 10	* 1	0.12	* 10
DR456	8.6	2.16	* 5	20	1.0	32	14.79	>100.0	12	52	97	2.04	* 10	1	0.12	* 10
DR457	35.4	1.72	45	20	0.5	118	9.82	>100.0	17	77	24	1.24	* 10	* 1	0.08	* 10
DR458	33.4	3.34	* 5	80	0.5	46	8.02	23.5	13	50	98	1.71	* 10	* 1	0.47	20
DR459	142.0	2.76	* 2	20	1.0	390	14.06	>100.0	21	78	63	1.95	* 10	* 1	0.09	10
DR460	9.0	3.70	28	110	1.0	* 10	12.32	19.0	6	59	61	2.15	* 10	* 1	0.44	10
DR461	3.0	0.87	35	20	2.0	10	5.10	5.5	8	40	139	0.58	* 10	* 1	0.28	30
DR462	40.0	1.10	5	10	2.0	92	>15.00	24.0	12	8	72	1.32	* 10	* 1	0.13	* 10
DR463	8.2	0.31	15	300	7.0	26	>15.00	10.5	13	7	79	0.91	* 10	3	0.02	* 10
DR464	2.0	1.22	16	20	* 0.5	* 10	>15.00	1.0	6	1	42	1.23	* 10	* 1	0.11	* 10
DR465	2.0	1.00	10	10	4.0	* 10	12.72	6.5	4	11	87	0.93	* 10	* 1	0.32	* 10
DR466	* 1.0	0.64	4	* 10	* 0.5	30	2.59	* 0.5	1	2	8	0.35	* 10	* 1	0.23	* 10
DR467	1.0	3.22	* 2	30	0.5	* 10	8.74	3.0	6	20	63	1.18	* 10	* 1	1.71	10
DR468	* 1.0	0.81	* 2	* 10	5.0	* 10	9.67	2.5	* 1	10	7	0.93	* 10	* 1	0.14	* 10
DR469	* 1.0	1.64	* 2	20	1.0	* 10	10.15	0.5	3	8	13	0.91	* 10	* 1	0.96	10
DR470	* 1.0	2.35	* 2	20	6.0	* 10	13.76	0.5	* 1	24	39	1.93	* 10	* 1	0.56	20
DR471	* 1.0	2.56	* 2	40	5.0	* 10	12.23	0.5	* 1	14	31	1.64	* 10	2	0.92	30
DR472	* 1.0	1.29	* 2	20	10.0	* 10	9.10	1.5	* 1	9	23	0.89	* 10	* 1	0.42	* 10
DR473	* 1.0	2.53	2	10	39.5	* 10	>15.00	2.0	1	24	247	1.70	* 10	* 1	0.11	20
DR474	* 1.0	2.02	* 2	20	47.0	* 10	>15.00	* 0.5	1	19	166	1.59	* 10	* 1	0.09	20
DR475	3.0	2.23	* 2	70	30.0	* 10	>15.00	16.5	4	5	42	2.04	10	2	0.87	20
DR476	5.0	3.54	* 2	20	101.0	* 10	>15.00	3.5	5	21	27	1.81	* 10	* 1	0.12	20
DR477	1.0	1.13	2	10	14.5	* 10	8.39	4.5	4	13	32	1.00	* 10	* 1	0.22	20

no.	Mg (Pct)	Mn (Pct)	Mo (Ppm)	Na (Pct)	Ni (Ppm)	P (Ppm)	Pb (Ppm)	Sb (Ppm)	Sc (Ppm)	Sr (Ppm)	Ti (Pct)	Tl (Ppm)	U (Ppm)	V (Ppm)	W (Ppm)	Zn (Ppm)
DR445	9.58	995	3	*0.01	10	100	716	15	2	89	*0.01	10	* 10	14	* 10	858
DR446	10.22	1000	2	*0.01	5	270	912	15	2	92	*0.01	* 10	* 10	10	* 10	992
DR447	1.35	2455	22	*0.01	6	290	>10000	55	1	658	*0.01	* 10	* 10	118	230	>10000
DR448	3.54	3235	3	*0.01	10	70	2708	20	2	244	*0.01	* 10	10	63	* 10	2954
DR449	2.41	195	3	0.09	21	340	148	5	3	334	0.24	* 10	* 10	37	* 10	716
DR450	0.88	150	2	0.14	18	530	26	8	2	337	0.22	* 10	* 10	25	* 10	34
DR451	2.25	475	1	0.01	13	220	212	20	8	282	0.18	* 10	10	28	30	736
DR452	2.56	170	2	0.14	28	500	14	* 2	4	335	0.26	* 10	* 10	43	10	44
DR453	2.02	195	3	0.11	25	410	214	10	3	368	0.27	* 10	* 10	34	* 10	696
DR454	1.99	210	16	0.06	14	360	24	8	2	249	0.15	* 10	20	22	* 10	70
DR455	0.90	380	19	0.11	20	550	452	4	3	313	0.27	* 10	10	71	10	684
DR456	1.62	1035	40	*0.01	18	190	1250	5	5	257	0.17	* 10	10	40	20	5250
DR457	1.26	830	219	*0.01	18	490	3918	5	3	217	0.20	* 10	* 10	221	30	>10000
DR458	2.23	405	4	0.03	21	530	616	15	4	374	0.22	* 10	* 10	44	* 10	>10000
DR459	3.17	1475	696	0.04	30	540	>10000	* 2	6	292	0.22	* 10	10	368	110	>10000
DR460	3.34	525	9	0.04	20	530	394	6	7	348	0.23	* 10	* 10	85	20	2222
DR461	1.92	1200	5	0.02	3	730	378	15	1	32	0.13	* 10	* 10	16	* 10	736
DR462	3.88	2095	16	*0.01	11	220	3062	25	2	96	0.09	* 10	* 10	14	* 10	3160
DR463	6.85	3820	* 1	*0.01	5	1710	1210	5	* 1	51	*0.01	* 10	* 10	8	10	2208
DR464	5.49	1095	2	0.02	8	200	52	4	3	137	0.04	* 10	* 10	18	* 10	648
DR465	5.18	2745	18	0.03	4	1750	720	4	2	76	0.06	* 10	* 10	13	10	826
DR466	1.29	1280	4	0.02	* 1	400	20	8	* 1	28	*0.01	* 10	10	4	* 10	116
DR467	5.90	860	3	0.06	11	730	76	* 2	3	67	0.17	* 10	* 10	26	10	818
DR468	9.92	4285	3	0.03	3	1650	222	4	* 1	44	0.02	* 10	20	17	20	654
DR469	6.62	875	6	0.03	3	3170	64	4	1	54	0.14	* 10	20	18	10	118
DR470	3.56	2485	7	0.04	6	1320	54	2	2	100	0.08	* 10	* 10	20	10	316
DR471	3.84	1865	1	0.04	8	1890	54	12	2	75	0.08	* 10	* 10	25	10	190
DR472	4.81	2930	3	0.04	1	510	50	4	1	27	0.11	* 10	20	13	10	370
DR473	0.92	2600	* 1	0.04	2	3610	28	8	3	121	0.15	* 10	20	18	20	248
DR474	0.66	3175	7	0.06	6	1900	106	4	4	135	0.16	* 10	20	16	10	284
DR475	3.14	5175	8	0.12	8	3580	494	* 2	2	102	0.14	* 10	30	18	40	6426
DR476	1.84	7410	6	0.06	10	3160	594	* 2	5	112	0.19	* 10	40	25	40	670
DR477	3.21	4815	4	0.06	5	6460	386	2	1	94	0.08	* 10	20	12	20	778

* The displayed value represents the lower detection limit for the test for that element.

< The displayed value represents the elevated lower detection limit for the test for that element. The LDL is elevated due to the presence of certain other elements in the sample.

> The displayed value represents the upper detection limit for the test for that element.

APPENDIX D.

Descriptions of mines and prospects in Dragoon Mountains Unit

Listings by sample number or range of sample numbers for most sites.

DR1-13

Golden Rule district (fig. 52)

Includes Golden Rule (Old Terrible) Mine, and numerous prospects (fig. 52), also the Texas-Arizona, Bignon, and Barrett Mines (locations not known) (Hampf, 1972, p. 3).

SUMMARY. Auriferous quartz veins originating from Tertiary rhyolite porphyry stock intruded bedding plane faults in middle limestone member of the Abrigo Formation. Mining near the carbonate-intrusive contact on a faulted vein has produced lead, gold and silver (Hampf, 1972, p. 44, 55). The district is outside of the National Forest, but adjoins the Dragoon Mountains Unit along the northern boundary. Several prospects in the southern part of the district were sampled during the USBM 1980 RARE II study. Pulps were re-run for this Coronado National Forest study. A prospect within a few hundred feet of the boundary was examined and sampled again in the Coronado study (DR7-8).

PRODUCTION AND STATUS. Current claim status unknown. Claims were apparently staked on at least part of the district in late 1991. Production is mentioned under mining history.

SIZE AND ORIENTATION OF THE DEPOSIT. A narrow (1/2-ft-wide) quartz vein strikes N. 50° to 60° W., and dips NE. 30° at the Golden Rule Mine. At another location in the mine, this vein strikes E.-W., and dips N. 80° to 85°, where the structure crosses bedding planes. The vein has been faulted into three segments, with a combined strike-length extent of 1,000 ft; mining down dip was in the range of 50-ft to 60-ft (Hampf, 1972, p. 44). Placers, which do not appear to be rich in gold, have not been fully developed due to lack of water (Hampf, 1972, p. 62, 64, 79, 80). The placers form outside the National Forest; all drainage is away from the Forest boundary.

MINERALOGY, GRADE. The Golden Rule Mine contains auriferous quartz veins that run approximately 0.5 oz to 2.5 oz Au/st, 1 oz to 4 oz Ag/st, and 3% to 17% Pb (Hampf, 1972, p. 82-84. The Bureau samples from the prospects near, but north of the Forest boundary, contain geochemically anomalous gold, but only one sample (DR8, a select sample of vein quartz) contains a high gold concentration (0.14 oz Au/st). That sample also exceeds 5.8 oz Ag/st and 1% lead. Other samples collected by USBM contain concentrations of gold, lead, and silver that are far below economic levels.

DEVELOPMENT POSSIBILITIES AND PROBLEMS. The auriferous quartz vein sampled by the USBM (DR8, fig. 53) was not seen in place. It likely strikes E.-W., based on the attitude of the inclined shaft from which it was excavated. Thus it likely parallels the Forest boundary, and remains on BLM-administered land. The discontinuance of prospects southward from DR7-11 (fig. 52, 53) suggest the district's metallization is diminishing at points as far south as the Dragoon Mountains Unit. Little time was spent here trying to find auriferous structures inside the Forest. None were observed.

MINING HISTORY. The gold mineralization was discovered by miners on the way to California in 1849 (the most famous U.S. gold rush), but wasn't developed. Wars between the US and the Apache Indians prevented development for some time. Mining from 1883 to 1957 recovered approximately 9,500 oz gold, and 350,000 lb lead from 6,000 st of ores at the Golden Rule Mine, the most productive mine in the district (Wilson, 1951, p. 28, 121; Hampf, 1972, p. 3, 43). Production, if any, from the sampled prospects (DR1-13), including those closest to the National Forest boundary, is not known.

TAILINGS AND DUMP. Not measured.

REMAINING EQUIPMENT. None reported.

MINE HAZARDS. None reported.

DR14

Unnamed limestone prospect (see fig. 2)

Possibly one of the Ligier-Arizona Marble Quarries, Inc. and the successor: Dragoon Marble Quarries.

SUMMARY. Limestone, pink-and-gray, and fossiliferous (crinoids), was excavated in a small trench to a maximum depth of 5 ft.

PRODUCTION AND STATUS. Inactive in Sep. 1991. No production; approximately 40 st were excavated (about 480 ft^3), but remains in place as a dump.

SIZE AND ORIENTATION OF THE DEPOSIT. Appears to be a pervasive limestone unit. No work was done to trace and measure the dimensions of the limestone.

MINERALOGY, GRADE. Not tested.

DEVELOPMENT POSSIBILITIES AND PROBLEMS. When considering development of this site, locating adequate markets is very important. Distance to those markets is also key, particularly if the limestone is to be used as one of the low-end priced commodities, such as crushed aggregate. A search for markets for this material was not conducted. Costs to quarry and crush the rock are approximately $2.30/st; trucking would cost about $1.50/mi in 20 st loads.

MINING HISTORY. Not known.

DUMP. 40 st.

REMAINING EQUIPMENT. None.

MINE HAZARDS. None.

DR15

Unnamed limestone prospect (see fig. 2)

Possibly part of the Ligier-Arizona Marble Quarries, Inc. and the successor: Dragoon Marble Quarries.

SUMMARY. Limestone, gray and tan, was excavated in a very shallow, 50-ft-long trench.

PRODUCTION AND STATUS. Status nôt known. Probably no production; complete pit dimensions not recorded.

SIZE AND ORIENTATION OF THE DEPOSIT. No work was done to trace and measure the dimensions of the limestone.

MINERALOGY, GRADE. Not tested.

DEVELOPMENT POSSIBILITIES AND PROBLEMS. When considering development of this site, locating adequate markets is very important. Distance tò those markets is also key, particularly if the limestone is to be used as one of the low-end priced commodities, such as crushed aggregate. A search for markets for this material was not conducted. Costs to quarry and crush the rock are approximately $2.30/st; trucking would cost about $1.50/mi in 20 st loads.

MINING HISTORY. Not known.

DUMP. No data.

REMAINING EQUIPMENT. None reported.

MINE HAZARDS. None likely.

DR16-17

Unnamed marble/limestone prospect (see fig. 2)

One of the Ligier-Arizona Marble Quarries, Inc. and the successor: Dragoon Marble Quarries.

SUMMARY. Marble and limestone, yellow-sienna color (see photo, fig. 8), was excavated in a shallow open cut, 51-ft by 28-ft and 2-ft to 10-ft-deep.

PRODUCTION AND STATUS. Status not known. Production, based on pit dimensions, was 600 st (or 7,140 ft^3). The largest blocks obtainable, based on fracture spacing, is about 3 ft^3. Production was most likely for crushed chip products.

SIZE AND ORIENTATION OF THE DEPOSIT. No work was done to trace the deposit extent to the NW. or SE. The pit highwall adjoins an overlying gray limestone. About 50 ft downslope (SW.) from the pit margin is an underlying gray limestone. The extent of the yellow-sienna marble may be limited in areal extent and may not continue at depth. It could be a weathering phenomenon. Roughly another 500 st of the yellow-sienna material is in place at the deposit, but drilling would be required to find more.

MINERALOGY, GRADE. Not tested.

DEVELOPMENT POSSIBILITIES AND PROBLEMS. The biggest limitation is the unknown continuity at depth of the marble color. It may not continue, but may instead become gray. The rock could be used as landscaping chips, an application in which color is a most-important characteristic. It could be mined and processed for about $2.30/st and rail-hauled in bulk to the largest market in the region, Tucson, AZ, for about $3.30/st.

MINING HISTORY. L. R. Ligier, a stone mason from Phoenix, AZ, was informed of the presence of marble near Dragoon, AZ by a stage-coach operator (Ligier is credited with discovering the Colorado Yule marble quarry, Marble, CO). In 1909, Ligier staked several marble placer claims on the north slope of the Dragoon Mountains. Litigation paralyzed the properties until 1929, seven years after the elder Ligier died. The Ligier sons held title to the marble sites but apparently did no work until about 1953 (Frank Johnson, 1963, p. 1; Johnson, 1953, p. 1). From approximately 1953 to late 1961, the Ligier-Arizona Marble Quarries, Inc. mined several colors of terrazzo marble chips and marble roofing granules from several quarries on the north front of the Dragoon Mountains and in the Gunnison Hills, the latter being north of and outside the National Forest . The chip-marble production included yellow-sienna marble from quarry DR16-17. Overall, the Ligier's production was carried on at a small scale, and demand for the materials exceeded production, but the operators were apparently lacking in capital equipment needed to increase production. Production diminished greatly in 1961, apparently due to decrease in demand (Johnson, 1953, p. 1; Johnson 1958b, p. 1; Johnson, 1960, p. 1; Johnson, 1961, p. 1).

Originally, the railhead east of Dragoon, AZ was used for shipping, but by 1960, all shipment was by truck (Johnson, 1953, p. 1; Johnson, 1960, p. 1). A crushing and screening plant was built at the Dragoon railhead in Apr. 1958 (Johnson, 1958b, p. 2).

In late 1962, the quarries were sold and became the Dragoon Marble Quarries, Inc., headquartered in nearby Dragoon, AZ. Production of crushed marble for terrazzo chips continued. Prefabricated concrete slabs were also considered as a product. Tucson and Phoenix, AZ were the major markets. The operation went on until at least Mar. 1963 (Axel Johnson, 1963, p. 1).

The quarry group was re-opened in Mar. 1985 by Dragoon Marble Corp., Pearce, AZ, but there is no record of production from that time. By 1986, the Ligier estate controlled the quarry group, and entered into a lease agreement with Sierra Marble Inc. (Frank Dumich and Bob Bliss). No production records are known from that arrangement. In the summer of 1988, Bliss Management, Tempe, AZ (Bob Bliss and partner Richard Bull) planned to produce terrazzo chips from some (unspecified) pits of the quarry group [probably through a lease arrangement], but again, no production records are known (ADMMR files, unpub., Phoenix, AZ).

DUMP. No data.

REMAINING EQUIPMENT. None reported.

MINE HAZARDS. None likely.

DR18-19

Breche Saguaro marble quarry (see fig. 2)

One of the Ligier-Arizona Marble Quarries, Inc.; later part of the Ligier-Arizona successor: Dragoon Marble Quarries.

SUMMARY. A varied-color marble conglomerate of gray, white, and sienna clasts (see fig. 12, photo) was quarried for dimension stone (see fig. 11, photo). One cut block of this marble, measuring 3-ft by 3-ft, and 7-ft-long, remains on the property. It was taken from pit DR19.

PRODUCTION AND STATUS. Inactive in Sep. 1991. Claims held under Ligier estate as of Aug. 1988. Production records are not known. The Ligier's were credited with production of over 4,000 st of marble dimension stone from all their quarries, some of which are in the Gunnison Hills, north of and outside the National Forest. The Breche Saguaro quarry appears to be solely for dimension stone. The pit sizes suggest that 7,000 ft^3 of the marble was moved at the southern quarry (DR18), but approximately 1,750 ft^3 remains in the quarry, as large, broken pieces. About 400 st were actually removed from quarry DR18. Quarry DR19 was worked for about 10,500 ft^3 of marble (or about 900 st), based on pit dimensions.

SIZE AND ORIENTATION OF THE DEPOSIT. This marble unit was mapped by the Bureau (fig.2). It extends NW. from the quarries for about 1,000 ft on strike, averages 13.5 ft in width, and dips steeply into the hillside (SW.) at 60°. If quarried along these dimensions, there would be about 22,500 st (or 270,000 ft^3) available to a depth of 20 ft. Twenty ft was chosen to minimize the amount of overburden removal. The true depth of the marble is unknown. It could be less than 20 ft, but that is unlikely, considering the long strike length.

MINERALOGY, GRADE. Not tested.

DEVELOPMENT POSSIBILITIES AND PROBLEMS. The material has been proven as competent enough for cutting as dimension stone. Drilling would be required to evaluate the competence at depth. Its polishing characteristics, essential to evaluate marble dimension stone, were not tested in this Bureau study, but Bain (1963) suggests that some parts of the unit may not accept a polish. That is a detrimental characteristic for a dimension marble. The marble dip, to the SW. (into the hillside) complicates mining, as the need for overburden removal is increased, and ultimately the depth to which it could be mined profitably will be diminished. Marble dimension stone value varies significantly with its aesthetic appeal.

The broken material in place at quarry DR18 could be readily used as landscape boulders (and many more tons produced), and the unit could be crushed into a chip landscaping rock. For the latter application, testing of crushing characteristics (hardness) would be judicious. Landscaping boulders sell for about $85/st. Marble chips for landscaping sell for about $32- to $40/st. Either material could be shipped in bulk by rail to the largest market in the region (Tucson, AZ) for about $3.30/st.

MINING HISTORY. L. R. Ligier, a stone mason from Phoenix, AZ, was informed of the presence of marble near Dragoon, AZ by a stage-coach operator (Ligier is credited with discovering the Colorado Yule marble quarry, Marble, CO). In 1909, Ligier staked several marble placer claims on the north slope of the Dragoon Mountains. Litigation paralyzed the properties until 1929, seven years after the elder Ligier died. The Ligier sons held title to the marble sites but apparently did no work until about 1953 (Frank Johnson, 1963, p. 1; Johnson, 1953, p. 1). From approximately 1953 to late 1961, the Ligier-Arizona Marble Quarries, Inc. mined several colors of terrazzo marble chips and marble roofing granules from several quarries on the north front of the Dragoon Mountains and in the Gunnison Hills, the latter being north of and outside the National Forest . No chip-marble production is known from the Breche Saguaro quarry. Overall, the Ligier's production was carried on at a small scale, and demand for the materials exceeded production, but the operators were apparently lacking in capital equipment needed to increase production. Production diminished greatly in 1961, apparently due to decrease in demand (Johnson, 1953, p. 1; Johnson 1958b, p. 1; Johnson, 1960, p. 1; Johnson, 1961, p. 1).

Originally, the railhead east of Dragoon, AZ was used for shipping, but by 1960, all shipment was by truck (Johnson, 1953, p. 1; Johnson, 1960, p. 1). A crushing and screening plant was built at the Dragoon railhead in Apr. 1958 (Johnson, 1958b, p. 2).

In late 1962, the quarries were sold and became the Dragoon Marble Quarries, Inc., headquartered in nearby Dragoon, AZ. Production of crushed marble for terrazzo chips continued. Prefabricated concrete slabs were also considered as a product. Tucson and Phoenix, AZ were the major markets. The operation went on until at least Mar. 1963 (Axel Johnson, 1963, p. 1).

The Ligier's were credited with production of over 4,000 st of marble dimension stone (Frank Johnson, 1963, p. 1); a significant amount of that total may have come from the Breche Saguaro quarry. Apparently, the dimension stone effort failed due to the small size of the operation. The marketing representative was also the quarryman and did not have time to develop adequate dimension stone markets. The switch to crushed terrazzo production was completed by 1958 (Mieritz, 1958, p. 3).

The quarry group was re-opened in Mar. 1985 by Dragoon Marble Corp., Pearce, AZ, but there is no record of production from that time. By 1986, the Ligier Estate controlled the quarry group, and entered into a lease agreement with Sierra Marble Inc. (Frank Dumich and Bob Bliss). No production records are known from that arrangement. In the summer of 1988, Bliss Management, Tempe, AZ (Bob Bliss and partner Richard Bull) planned to produce terrazzo chips from some (unspecified) pits of the quarry group [probably through a lease arrangement], but again, no production records are known (ADMMR files, unpub., Phoenix, AZ).

DUMP. See "production and status" section, above.

REMAINING EQUIPMENT. None.

MINE HAZARDS. None. A forester from the Douglas Ranger District reported that rattlesnakes were quite common at the property, among the broken marble blocks. None were encountered during the USBM Sep. 1991 evaluation, which was in relatively cool weather.

DR20

Unnamed limestone quarry (see fig. 2)

Possibly part of the Ligier-Arizona Marble Quarries, Inc. and the successor: Dragoon Marble Quarries.

SUMMARY. Limestone, pinkish-gray, and fossiliferous, was quarried to a maximum depth of 17 ft.

PRODUCTION AND STATUS. Inactive in Sep. 1991. Production records not known. Pit dimensions suggest of about 700 st limestone were quarried (based on 8740 ft^3 of rock removed); at least 10% of the rock remains on the quarry floor.

SIZE AND ORIENTATION OF THE DEPOSIT. Appears to be a pervasive limestone unit. No work was done to trace and measure the dimensions of the limestone. The main part of the pit is about 30-ft by 35-ft, with a 17-ft highwall.

MINERALOGY, GRADE. Not tested.

DEVELOPMENT POSSIBILITIES AND PROBLEMS. When considering development of this site, locating adequate markets is very important. Distance to those markets is also key, particularly if the limestone is to be used as one of the low-end priced commodities, such as crushed aggregate. A search for markets for this material was not conducted. Costs to quarry and crush the rock are approximately $2.30/st; trucking would cost about $1.50/mi in 20 st loads.

MINING HISTORY. Not known.

DUMP. See map, below.

REMAINING EQUIPMENT. None.

MINE HAZARDS. None.

DR21-26

Red marble quarry (see fig. 2, and mine map: fig. 3)

One of the Ligier-Arizona Marble Quarries, Inc.; later part of the Ligier-Arizona successor: Dragoon Marble Quarries.

SUMMARY. Red and pink marble were quarried (see fig. 9, photo), mostly for terrazzo chips.

PRODUCTION AND STATUS. Inactive in Sep. 1991. Claims held under Ligier estate as of Aug. 1988. A small amount of marble mined there in 1988. Production records are not known. The ***combined*** crushed marble output ran approximately 50 st to 75 st per week from all the quarries in the Dragoons and the Gunnison Hills from about 1953 to about 1960, and again in 1963. The pit dimensions at the Red marble quarry suggest no more than 7,500 st (based on 89,500 ft^3 of excavation) were produced there; 2,300 st (27,700 ft^3) of broken rock remains on the site as waste.

SIZE AND ORIENTATION OF THE DEPOSIT. There are three parts to this deposit, according to work done by Bain (1963, p. 32). The first part is in the Red marble quarry, which contains 7,000 st (84,000 ft^3) of indicated red-pink marble resources. It is assumed that little production other than Parrish Co's took place after Bain did his early 1960's estimation. The second part of the deposit is not in the quarry, but to the east, in T. 16 S., R. 23 E., in both the NW 1/4 and the SW 1/4 of sec. 26., where Bain (1963, p. 32) estimated 30,000 st (356,000 ft^3) of indicated red-pink marble resources. The area was not visited by the USBM in the Coronado study, and Bain's mapping was not included with his report; those data are apparently lost. The area was never mined. The third part of the deposit is also outside of the Red marble quarry. This part is to the south, in T. 16 S., R 23 E., NW. 1/4, SE. 1/4, sec. 27, where Bain (1963, p. 32) estimated 3,800 st (46,000 ft^3) of red-pink indicated marble resources. The area was not visited by the USBM and Bain's mapping of the site is not available. The area was never mined.

MINERALOGY, GRADE. Not tested.

DEVELOPMENT POSSIBILITIES AND PROBLEMS. The rock is not suitable for dimension stone, due to fracturing and resultant small sizes of any potential dimension blocks. The rock could be used as chip marble for landscaping material, and as larger landscaping boulders. That commodity could be quarried and processed for about $2.30/st and could be bulk-shipped by rail to the largest market in the region (Tucson, AZ) for about $3.30 st. The landscaping chips sell for $32- to $40/st and the landscaping boulders sell for about $85/st.

MINING HISTORY. L. R. Ligier, a stone mason from Phoenix, AZ, was informed of the presence of marble near Dragoon, AZ by a stage-coach operator (Ligier is credited with discovering the Colorado Yule marble quarry, Marble, CO). In 1909, Ligier staked several marble placer claims on the north slope of the Dragoon Mountains. Litigation paralyzed the properties until 1929, seven years after the elder Ligier died. The Ligier sons held title to the marble sites but apparently did no work until about 1953 (Frank Johnson, 1963, p. 1; Johnson, 1953, p. 1). From approximately 1953 to late 1961, the Ligier-Arizona Marble Quarries, Inc. mined several colors of terrazzo marble chips and marble roofing granules from several quarries on the north front of the Dragoon Mountains and in the Gunnison Hills, the latter being north of and outside the National Forest. This included red and pink marble from the Red marble quarry. Overall, the Ligier's production was carried on at a small scale, and demand for the materials exceeded production, but the operators were apparently lacking in capital equipment needed to increase production. Production diminished greatly in 1961, apparently due to decrease in demand (Johnson, 1953, p. 1; Johnson 1958b, p. 1; Johnson, 1960, p. 1; Johnson, 1961, p. 1).

Originally, the railhead east of Dragoon, AZ was used for shipping, but by 1960, all shipment was by truck (Johnson, 1953, p. 1; Johnson, 1960, p. 1). A crushing and screening plant was built at the Dragoon railhead in Apr. 1958 (Johnson, 1958b, p. 2).

In late 1962, the quarries were sold and became the Dragoon Marble Quarries, Inc., headquartered in nearby Dragoon, AZ. Production of crushed marble for terrazzo chips continued. Prefabricated concrete slabs were also considered as a product. Tucson and Phoenix, AZ were the major markets. The operation went on until at least Mar. 1963 (Axel Johnson, 1963, p. 1).

The Ligier's were credited with production of over 4,000 st of marble dimension stone (Frank Johnson, 1963, p. 1), though none of this came from the Red marble quarry. Apparently, the dimension stone effort failed due to the small size of the operation. The marketing representative was also the quarryman and did not have time to develop adequate dimension stone markets. The switch to crushed terrazzo production was completed by 1958 (Mieritz, 1958, p. 3).

In 1986, Bob Bliss of the Red Mountain Mining Co. planned to expand the quarry. There is no record of any production taking place. In 1988, the Parrish Co., of Tucson, AZ mined 160 st of marble from the Red marble quarry (USDA, Forest Service files, Douglas, AZ). The site was known as the Yuma claims at that time.

The quarry group was re-opened in Mar. 1985 by Dragoon Marble Corp., Pearce, AZ, but there is no record of production from that time. By 1986, the Ligier Estate controlled the quarry group, and entered into a lease agreement with Sierra Marble Inc. (Frank Dumich and Bob Bliss). No production records are known from that arrangement. In the summer of 1988, Bliss Management, Tempe, AZ (Bob Bliss and partner Richard Bull) planned to produce terrazzo chips from some (unspecified) pits of the quarry group [probably through a lease arrangement], but again, no production records are known (ADMMR files, unpub., Phoenix, AZ).

DUMP. See mine map. About 2,300 st of waste rock on the site.

REMAINING EQUIPMENT. None.

MINE HAZARDS. None.

DR27-28

Unnamed limestone and marble quarries (see fig. 2 and mine map: fig. 4)

The marble quarry (northern pit) is one of the Ligier-Arizona Marble Quarries, Inc.; later part of the Ligier-Arizona successor: Dragoon Marble Quarries.

SUMMARY. Red and pink marble were quarried, mostly for terrazzo chips. From the southern pit, limestone was quarried.

PRODUCTION AND STATUS. Inactive in Sep. 1991. Production records not known. Pit dimensions suggest 14,400 ft^3 of limestone (or about 1,200 st) were quarried from pit DR27-28, and that 7,500 ft^3 of pink and gray marble.(or about 600 st) were quarried from the northern, un-sampled pit. Claims held under Ligier estate as of Aug. 1988. The ***combined*** *crushed marble output ran approximately* 50 st to 75 st per week from all the quarries in the Dragoons and the Gunnison Hills from about 1953 to about 1960, and again in 1963. Little is known about production of limestone, if any, by the Ligiers.

SIZE AND ORIENTATION OF THE DEPOSIT. Limestone: pit DR27-28, a 16-ft-thick bed was sampled, which extends for a minimum of 100 ft along strike, and for quarrying purposes (which are to keep overburden removal to a minimum), a 10-ft "width" was assigned. These dimensions allow a minimum of 16,000 ft^3 of limestone (or about 1,300 st). No work was done by USBM for the purpose of tracing out beds and estimating tonnage of potential marble resources. There are shaley interbeds, which do not enhance the value of this marble deposit. Economic material will be that which is relatively uniform, and can be blasted, hauled, crushed, and sorted. There is no provision to separate unwanted lithologies, such as shale interbeds. Bain (1963, p. 32) estimated 11,300 st (136,000 ft^3) of red-pink indicated marble resources at the quarry. It is assumed that little, if any, has been removed since Bain work in the early 1960's.

MINERALOGY, GRADE. Not tested.

DEVELOPMENT POSSIBILITIES AND PROBLEMS. Shale interbeds detract from the marble's value. The rock could be used as chip marble for landscaping material, and as larger landscaping boulders. That commodity could be quarried and processed for about \$2.30/st and could be bulk-shipped by rail to the largest market in the region (Tucson, AZ) for about \$3.30 st. The landscaping chips sell for \$32- to \$40/st and the landscaping boulders sell for about \$85/st.

Limestone: when considering development of the southern quarry, locating adequate markets is very important. Distance to those markets is also key, particularly if the limestone is to be used as one of the low-end priced commodities, such as crushed aggregate. A search for markets for this material was not conducted. Costs to quarry and crush the rock are approximately \$2.30/st; trucking would cost about \$1.50/mi in 20 st loads.

MINING HISTORY. L. R. Ligier, a stone mason from Phoenix, AZ, was informed of the presence of marble near Dragoon, AZ by a stage-coach operator (Ligier is credited with discovering the Colorado Yule marble quarry, Marble, CO). In 1909, Ligier staked several marble placer claims on the north slope of the Dragoon Mountains. Litigation paralyzed the properties until 1929, seven years after the elder Ligier died. The Ligier sons held title to the marble sites but apparently did no work until about 1953 (Frank Johnson, 1963, p. 1; Johnson, 1953, p. 1). From approximately 1953 to late 1961, the Ligier-Arizona Marble Quarries, Inc. mined several colors of terrazzo marble chips and marble roofing granules from several quarries on the north front of the Dragoon Mountains and in the Gunnison Hills, the latter being north of and outside the National Forest. The chip production probably included pink marble from the un-sampled northern quarry. Overall, the Ligier's production was carried on at a small scale, and demand for the materials exceeded production, but the operators were apparently lacking in capital equipment needed to increase production. Production diminished greatly in 1961, apparently due to decrease in demand (Johnson, 1953, p. 1; Johnson 1958b, p. 1; Johnson, 1960, p. 1; Johnson, 1961, p. 1).

Originally, the railhead east of Dragoon, AZ was used for shipping, but by 1960, all shipment was by truck (Johnson, 1953, p. 1; Johnson, 1960, p. 1). A crushing and screening plant was built at the Dragoon railhead in Apr. 1958 (Johnson, 1958b, p. 2).

In late 1962, the quarries were sold and became the Dragoon Marble Quarries, Inc., headquartered in nearby Dragoon, AZ. Production of crushed marble for terrazzo chips continued. Prefabricated concrete slabs were also considered as a product. Tucson and Phoenix, AZ were the major markets. The operation went on until at least Mar. 1963 (Axel Johnson, 1963, p. 1).

The Ligier's were credited with production of over 4,000 st of marble dimension stone (Frank Johnson, 1963, p. 1), though none of this came from the un-sampled quarry. Apparently, the dimension stone effort failed due to the small size of the operation. The marketing representative was also the quarryman and did not have time to develop adequate dimension stone markets. The switch to crushed terrazzo production was completed by 1958 (Mieritz, 1958, p. 3).

Little is known of the history of limestone production from this area (pit DR27-28); one report states the rock was used for "building material", which was likely some form of crushed aggregate or small stone blocks (ADMMR files, unpub., 1988, Phoenix, AZ). No dimension stone was produced.

The quarry group was re-opened in Mar. 1985 by Dragoon Marble Corp., Pearce, AZ, but there is no record of production from that time. By 1986, the Ligier Estate controlled the quarry group, and entered into a lease agreement with Sierra Marble Inc. (Frank Dumich and Bob Bliss). No production records are known from that arrangement. In the summer of 1988, Bliss Management, Tempe, AZ (Bob Bliss and partner Richard Bull) planned to produce terrazzo chips from some (unspecified) pits of the quarry group [probably through a lease arrangement], but again, no production records are known (ADMMR files, unpub., Phoenix, AZ).

DUMP. Little waste rock on the property. See mine map.

REMAINING EQUIPMENT. None.

MINE HAZARDS. None.

DR29

Unnamed dolomite quarry (see fig. 2)

Possibly part of the Ligier-Arizona Marble Quarries, Inc. and the successor: Dragoon Marble Quarries.

SUMMARY. Dolomite, light gray and medium gray was quarried to a depth of 7.5 ft.

PRODUCTION AND STATUS. Inactive in Sep. 1991. Production records not known. Pit dimensions suggest of dolomite about 400 st was quarried (based on 4,900 ft^3 excavation), but at least 200 st was left behind (or about 2,100 ft^3), apparently as waste rock.

SIZE AND ORIENTATION OF THE DEPOSIT. Orientation uncertain, due to disruption of beds by blasting. No work was done to trace and measure the dimensions of the dolomite beds. Pit dimensions are about 40-ft by 40-ft and as much as 7.5-ft-deep.

MINERALOGY, GRADE. Not tested.

DEVELOPMENT POSSIBILITIES AND PROBLEMS. When considering development of this rock, locating adequate markets is very important. Distance to those markets is also key, particularly if the rock is to be used as one of the low-end priced commodities, such as crushed aggregate. A search for markets for this material was not conducted. Costs to quarry and crush the rock are approximately $2.30/st; trucking would cost about $1.50/mi in 20 st loads.

MINING HISTORY. Not known.

DUMP. Little waste rock on the property.

REMAINING EQUIPMENT. None.

MINE HAZARDS. None.

DR30

Unnamed limestone quarry (see fig. 2)

Possibly part of the Ligier-Arizona Marble Quarries, Inc. and the successor: Dragoon Marble Quarries.

SUMMARY. Limestone, gray, was quarried to a depth of 3 ft.

PRODUCTION AND STATUS. Inactive in 1980. Production records not known. Pit dimensions suggest 1,200 ft^3 of limestone (or about 100 st) was excavated, though most probably remains on the property. The "dump" was not measured during the 1980 USBM RARE II study.

SIZE AND ORIENTATION OF THE DEPOSIT. No data.

MINERALOGY, GRADE. No data.

DEVELOPMENT POSSIBILITIES AND PROBLEMS. When considering development of this rock, locating adequate markets is very important. Distance to those markets is also key, particularly if the rock is to be used as one of the low-end priced commodities, such as crushed aggregate. A search for markets for this material was not conducted. Costs to quarry and crush the rock are approximately $2.30/st; trucking would cost about $1.50/mi in 20 st loads.

MINING HISTORY. Not known.

DUMP. No data.

REMAINING EQUIPMENT. None reported.

MINE HAZARDS. None reported.

DR31-33

Green chip marble quarry (see fig. 5 and mine map: fig. 6)

One of the Ligier-Arizona Marble Quarries, Inc.; later part of the Ligier-Arizona successor: Dragoon Marble Quarries.

SUMMARY. Intermixed green-gray marble with white quartzite clasts and green slate were quarried, for terrazzo chips (see fig. 10, photo).

PRODUCTION AND STATUS. Inactive in Sep. 1991. Claims held under Ligier estate as of Aug. 1988. Production records are not known. The ***combined*** crushed marble output ran approximately 50 st to 75 st per week from all the quarries in the Dragoons and the Gunnison Hills from about 1953 to about 1960, and again in 1963. The pit dimensions at the Green Chip marble quarry suggest no more than 6,800 st (81,500 ft^3) were mined there, and at least 1,000 st (11,500 ft^3) of that material is still in the quarry, apparently as waste rock.

SIZE AND ORIENTATION OF THE DEPOSIT. The deposit was not traced out from the quarry site during the Bureau's examination. Bain (1964b, p. 2) did that job, and reported a 46,500 st reserve at the site, which was based on what could be quarried effectively with the small operation run by the Dragoon Marble Quarries, Inc. The deposit, according to Bain (1964b, p. 2), dips to the southeast, and another 150,000 st may be present there, but concealed. Bain also suggested underground quarrying as a technique to increase the resource base at the property.

MINERALOGY, GRADE. Not tested

DEVELOPMENT POSSIBILITIES AND PROBLEMS. The thin bedding of the material and the interbedded slate limit this site to production of crushed marble chips. Terrazzo chips and landscaping material are possible products. Slate and quartzite "contamination", which also imparts the color to this unit, may limit terrazzo chip application. There may be additional resources of green-chip marble southward towards DR40-50 quarries, according to Bain (1964b, p. 3), but neither Bain nor the USBM took the time to map this unit.

MINING HISTORY. L. R. Ligier, a stone mason from Phoenix, AZ, was informed of the presence of marble near Dragoon, AZ by a stage-coach operator (Ligier is credited with discovering the Colorado Yule marble quarry, Marble, CO). In 1909, Ligier staked several marble placer claims on the north slope of the Dragoon Mountains. Litigation paralyzed the properties until 1929, seven years after the elder Ligier died. The Ligier sons held title to the marble sites but apparently did no work until about 1953 (Frank Johnson, 1963, p. 1; Johnson, 1953, p. 1). From approximately 1953 to late 1961, the Ligier-Arizona Marble Quarries, Inc. mined several colors of terrazzo marble chips and marble roofing granules from several quarries on the north front of the Dragoon Mountains and in the Gunnison Hills, the latter being north of and outside the National Forest . This included green and white chip marble from the Green Chip marble quarry. Overall, the Ligier's production was carried on at a small scale, and demand for the Ligier's marble products exceeded production, but the operators were apparently lacking in capital equipment needed to increase production.

Production diminished greatly in 1961, apparently due to decrease in demand (Johnson, 1953, p. 1; Johnson 1958b, p. 1; Johnson, 1960, p. 1; Johnson, 1961, p. 1).

Originally, the railhead east of Dragoon, AZ was used for shipping, but by 1960, all shipment was by truck (Johnson, 1953, p. 1; Johnson, 1960, p. 1). A crushing and screening plant was built at the Dragoon railhead in Apr. 1958 (Johnson, 1958b, p. 2).

In late 1962, the quarries were sold and became the Dragoon Marble Quarries, Inc., headquartered in nearby Dragoon, AZ. Production of crushed marble for terrazzo chips continued. Prefabricated concrete slabs were also considered as a product. Tucson and Phoenix, AZ were the major markets. The operation went on until at least Mar. 1963 (Axel Johnson, 1963, p. 1).

The Ligier's were credited with production of over 4,000 st of marble dimension stone (Frank Johnson, 1963, p. 1), though none of this came from the Green Chip quarry. Apparently, the dimension stone effort failed due to the small size of the operation. The marketing representative was also the quarryman and did not have time to develop adequate dimension stone markets. The switch to crushed terrazzo production was completed by 1958 (Mieritz, 1958, p. 3).

The quarry group was re-opened in Mar. 1985 by Dragoon Marble Corp., Pearce, AZ, but there is no record of production from that time. By 1986, the Ligier Estate controlled the quarry group, and entered into a lease agreement with Sierra Marble Inc. (Frank Dumich and Bob Bliss). No production records are known from that arrangement. In the summer of 1988, Bliss Management, Tempe, AZ (Bob Bliss and partner Richard Bull) planned to produce terrazzo chips from some (unspecified) pits of the quarry group [probably through a lease arrangement], but again, no production records are known (ADMMR files, unpub., Phoenix, AZ).

DUMP. See mine map, fig. 6, and "production and status" section, above.

REMAINING EQUIPMENT. None.

MINE HAZARDS. None.

DR34-35

Apache Yellow marble quarries

Part of the Ligier-Arizona Marble Quarries, Inc.; later part of the Ligier-Arizona successor: Dragoon Marble Quarries.

SUMMARY. Northern pit was quarried for dimension stone composed of yellow-white "mottled" color marble. Southern pit contains yellow and brown marble; probably produced as a crushed chip product.

PRODUCTION AND STATUS. Inactive in Sep. 1991. Claims held under Ligier estate as of Aug. 1988. Production records are not known. The ***combined*** crushed marble output ran approximately 50 st to 75 st per week from all the quarries in the Dragoons and the Gunnison Hills from about 1953 to about 1960, and again in 1963. The pit dimensions at the *southern* Apache Yellow marble quarry suggest no more than 500 st (based on 6,200 ft^3 excavation) were mined there. The *northern* Apache Yellow marble quarry, based on pit dimensions, was mined for about 700 st of dimension stone (about 11,500 ft^3).

SIZE AND ORIENTATION OF THE DEPOSIT. The deposit was not traced out from the quarry site during the USBM examination.

MINERALOGY, GRADE. Not tested

DEVELOPMENT POSSIBILITIES AND PROBLEMS. The color may be a factor of weathering, and thus not persist at depth. This factor must be ascertained through drilling before any further assessment of the deposits are made.

MINING HISTORY. L. R. Ligier, a stone mason from Phoenix, AZ, was informed of the presence of marble near Dragoon, AZ by a stage-coach operator (Ligier is credited with discovering the Colorado Yule marble quarry, Marble, CO). In 1909, Ligier staked several marble placer claims on the north slope of the Dragoon Mountains. Litigation paralyzed the properties until 1929, seven years after the elder Ligier died. The Ligier sons held title to the marble sites but apparently did no work until about 1953 (Frank Johnson, 1963, p. 1; Johnson, 1953, p. 1). From approximately 1953 to late 1961, the Ligier-Arizona Marble Quarries, Inc. mined several colors of terrazzo marble chips and marble roofing granules from several quarries on the north front of the Dragoon Mountains and in the Gunnison Hills, the latter being north of and outside the National Forest. This most likely included chip marble from the southern Apache Yellow marble quarry. Overall, production was carried on at a small scale, and demand for the Ligier's marble products exceeded production, but the operators were apparently lacking in capital equipment needed to increase production. Production diminished greatly in 1961, apparently due to decrease in demand (Johnson, 1953, p. 1; Johnson 1958b, p. 1; Johnson, 1960, p. 1; Johnson, 1961, p. 1).

Originally, the railhead east of Dragoon, AZ was used for shipping, but by 1960, all shipment was by truck (Johnson, 1953, p. 1; Johnson, 1960, p. 1). A crushing and screening plant was built at the Dragoon railhead in Apr. 1958 (Johnson, 1958b, p. 2).

In late 1962, the quarries were sold and became the Dragoon Marble Quarries, Inc., headquartered in nearby Dragoon, AZ. Production of crushed marble for terrazzo chips continued. Prefabricated concrete slabs were also considered as a product. Tucson and Phoenix, AZ were the major markets. The operation went on until at least Mar. 1963 (Axel Johnson, 1963, p. 1).

The Ligier's were credited with production of over 4,000 st of marble dimension stone (Frank Johnson, 1963, p. 1); roughly 700 st of that total came from the northern Apache Yellow marble quarry, based on pit size. Apparently, the dimension stone effort failed due to the small size of the operation. The marketing representative was also the quarryman and did not have time to develop adequate dimension stone markets. The switch to crushed terrazzo production was completed by 1958 (Mieritz, 1958, p. 3).

The quarry group was re-opened in Mar. 1985 by Dragoon Marble Corp., Pearce, AZ, but there is no record of production from that time. By 1986, the Ligier Estate controlled the quarry group, and entered into a lease agreement with Sierra Marble Inc. (Frank Dumich and Bob Bliss). No production records are known from that arrangement. In the summer of 1988, Bliss Management, Tempe, AZ (Bob Bliss and partner Richard Bull) planned to produce terrazzo chips from some (unspecified) pits of the quarry group [probably through a lease arrangement], but again, no production records are known (ADMMR files, unpub., Phoenix, AZ).

DUMP. Little waste rock on the property. See mine map.

REMAINING EQUIPMENT. One quarry bar remains at the Apache Yellow dimension stone quarry.

MINE HAZARDS. None.

DR36-38

Unnamed prospects

SUMMARY. Two shallow pits exposed heavily quartz-veined zones in marble. Pits possibly were excavated for metals exploration, rather than to prospect the marble occurrence.

PRODUCTION AND STATUS. Status unknown. No production.

SIZE AND ORIENTATION OF THE DEPOSIT. The quartz veining was not traced out from the pits during the USBM Apr. 1991 examination.

MINERALOGY, GRADE. No anomalous metal concentrations were detected in assays from three samples.

DEVELOPMENT POSSIBILITIES AND PROBLEMS. No development possibilities suggested.

MINING HISTORY. Unknown.

DUMP. Of negligible size.

REMAINING EQUIPMENT. None reported.

MINE HAZARDS. None reported.

DR39-50

White marble quarries

Part of the Ligier-Arizona Marble Quarries, Inc.; later part of the Ligier-Arizona successor: Dragoon Marble Quarries. Part also known as the Paul claim (just the DR45-50 pit and un-mined land in T. 16 S., R. 23 E., NW. 1/4, SE. 1/4, sec. 33) (Bain, 1963, p. 28). Apparently part of the Godfather claims, 1981 to at least 1988. A.k.a. the Tapia stone quarries, after a lessee who produced dimension marble from the sites about 1988.

SUMMARY. Quarried for crushed white marble at three sites in "White Quarry Gulch". Some of the crushed marble may have been used for roofing granules (heat reflectors), but most of the Ligier-era production of crushed marble was for terrazzo chips. Some dimension marble produced for use in fireplaces in 1988 (ADMMR files, unpub., Phoenix, AZ).

PRODUCTION AND STATUS. Inactive in Sep. 1991. Claims held under Ligier estate as of Aug. 1988. Production records are not known. The ***combined*** crushed marble output ran approximately 50 st to 75 st per week from all the quarries in the Dragoons and the Gunnison Hills from about 1953 to about 1960, and again in 1963. The pit dimensions at the *southern* (largest) of the three White marble quarries (DR44-50) suggest about 34,300 st (412,200 ft^3) of marble were mined. In addition, about 7,900 st (95,000 ft^3) of broken rock remains on the property (1,600 st as stockpiled marble and 6,300 st as waste rock). The central White marble quarry (DR40-43) was quarried for about 15,600 st (186,750 ft^3) of marble, based on pit dimensions. The *northernmost* of the three White marble quarries (DR39) is the smallest. About 2,300 st (28,000 ft^3) were mined there, based on pit dimensions. Marmobello Corp., run by the DeZonia's, had the Godfather claims staked over some or all of the White marble quarries in early 1981. At the site, Manuel Hernandez of Pearce, AZ, and Marvin Dunagan of Willcox, AZ, removed an un-quantified amount of loose marble with front end loaders and hauled it to an Arizona Electric Power Corp. plant (possibly the one near Cochise, AZ) (USDA, Forest Service files, Douglas, AZ). The product was probably used for reduction of sulfur-dioxide emissions. There is some uncertainty about which quarry or quarries supplied the rock, and a remote possibility that the production came from the Green Chip quarry. Dale Tapia's late 1980's production of "dimension" marble (probably small blocks or facing tiles) for use in fireplaces is un-quantified.

SIZE AND ORIENTATION OF THE DEPOSIT. Bain (1963, p. 32) traced outcrops in the vicinity of the White marble quarries and estimated the following indicated class marble resources: overall, 2.4 million st of white marble. It is assumed that very little of this material was removed since Bain's work was done. Of the total, 950,000 st (based on 11,350,000 ft^3) are at the southernmost of the White quarries (DR44-50), which is part of the Paul claim, and 1,300,000 st (based on 16,125,000 ft^3) are on the un-mined part of the Paul claim to the south (T. 17 S., R. 23 E., sec. 4). Exact boundary of the Paul claim was not found during research for this project. Bain (1963, p. 32) also estimated that the northern and central two pits of the White quarries (DR39 and DR40-43), combined, contain 180,000 st of marble resources (based on 2,160,000 ft^3).

MINERALOGY, GRADE. Not tested.

DEVELOPMENT POSSIBILITIES AND PROBLEMS. Bain's (1963, p. 4) assessment is that the density of fracturing in this rock prevents use of most of it as dimension marble. The product line is therefore limited to crushed marble chips for use as roofing granules. The crushed white chips are not popular in the regional as landscaping chips (ground cover); earth tones prevail in the market. Therefore the limited product line is the major consideration for this white marble deposit. Competition for the major market area, Tucson, AZ, is already in place. White marble roofing granules are mined by Catalina Marble, Inc., in Catalina, AZ, about 20 mi north of Tucson. The White marble quarries, in comparison, are about 70 mi from Tucson, AZ.

MINING HISTORY. L. R. Ligier, a stone mason from Phoenix, AZ, was informed of the presence of marble near Dragoon, AZ by a stage-coach operator (Ligier is credited with discovering the Colorado Yule marble quarry, Marble, CO). In 1909, Ligier staked several marble placer claims on the north slope of the Dragoon Mountains. Litigation paralyzed the properties until 1929, seven years after the elder Ligier died. The Ligier sons held title to the marble sites but apparently did no work until about 1953 (Frank Johnson, 1963, p. 1; Johnson, 1953, p. 1). From approximately 1953 to late 1961, the Ligier-Arizona Marble Quarries, Inc. mined several colors of terrazzo marble chips, and mined marble roofing granules from several quarries on the north front of the Dragoon Mountains and in the Gunnison Hills, the latter being north of and outside the National Forest. This included chip marble from the three White marble quarries. Overall, the Ligier's production was carried on at a small scale, and demand for the Ligier's marble products exceeded production, but the operators were apparently lacking in capital equipment needed to increase production. Production diminished greatly in 1961, apparently due to decrease in demand (Johnson, 1953, p. 1; Johnson 1958b, p. 1; Johnson, 1960, p. 1; Johnson, 1961, p. 1).

Originally, the railhead east of Dragoon, AZ was used for shipping, but by 1960, all shipment was by truck (Johnson, 1953, p. 1; Johnson, 1960, p. 1). A crushing and screening plant was built at the Dragoon railhead in Apr. 1958 (Johnson, 1958b, p. 2).

In late 1962, the quarries were sold and became the Dragoon Marble Quarries, Inc., headquartered in nearby Dragoon, AZ. Production of crushed marble for terrazzo chips continued. Prefabricated concrete slabs were also considered as a product. Tucson and Phoenix, AZ were the major markets. The operation went on until at least Mar. 1963 (Axel Johnson, 1963, p. 1).

The Ligier's were credited with production of over 4,000 st of marble dimension stone (Frank Johnson, 1963, p. 1); none of it came from the White quarries. Apparently, the dimension stone effort failed due to the small size of the operation. The marketing representative was also the quarryman and did not have time to develop adequate dimension stone markets. The switch to crushed terrazzo production was completed by 1958 (Mieritz, 1958, p. 3).

Under the name "Godfather claims", the quarries were controlled by the DeZonia's Marmobello Corp. Some loose rock was removed for use in power plants in sulfur-dioxide emission control. The production was during 1981 (USDA, Forest Service files, Douglas, AZ). The quarry group was re-opened in Mar. 1985 by Dragoon Marble Corp., Pearce, AZ, but there is no record of production from that time. By 1986, the Ligier Estate controlled the quarry group, and entered into a lease agreement with Sierra Marble Inc. (Frank Dumich and Bob Bliss). No production records are known from that arrangement. In the summer of 1988, Bliss Management, Tempe, AZ (Bob Bliss and partner Richard Bull) planned to produce terrazzo chips from some (unspecified) pits of the quarry group [probably through a lease

DR51-75

Jordan Canyon prospects (see fig. 5 and mine map: fig. 49)

SUMMARY. Fractured marble at or near contact with granite and schist. Minor silication of the marble. Copper carbonates, hematite, and minor sulfides evident. No production. These minor shows of metallic minerals are common this close to acid intrusive rocks.

PRODUCTION AND STATUS. Claim status unknown. No record of any production.

SIZE AND ORIENTATION OF THE DEPOSIT. Most of the investigation was done years ago during the RARE II study. Most structures (silicified faults in igneous rocks) were not measured with respect to their extent, size. Talus conditions may have prevented such measurements. No continuous, mineralized structures of minable widths were noted.

MINERALOGY, GRADE. Only two samples from the prospect group have elevated metal concentrations: a high grade from the dump of DR56-60 adit (sample DR68) has over 1% copper; fault zone DR69 (from a trench) also contains >1% Cu.

DEVELOPMENT POSSIBILITIES AND PROBLEMS. No resource are estimated, based on the available data. A minable structure of substantial tonnage and pervasive high metal concentrations are lacking, based on available samples and data.

MINING HISTORY. Unknown. Diamond drilling was conducted by Minerals Exploration Co. in 1974. Drill sites, results, and assays are not known.

TAILINGS AND DUMP. The larger dumps were measured; see sample descriptions.

REMAINING EQUIPMENT. None reported.

MINE HAZARDS. None reported.

DR78-79

Rainbow patent (fig. 5)
a.k.a. Dragoon Lead-Zinc Mine.

SUMMARY. Fractured schist overlain by limestone with lead and zinc sulfides in the fractures; fractures apparently trend E.-W. Granite at unspecified depth below schist. Quartzite between schist and granite. Workings have been flooded and inaccessible since 1914. Old reports suggest a wide, possibly flat zone of lead-zinc mineralization that is at least 65-ft-thick. Dumps suggest at least some skarn.

PRODUCTION AND STATUS. A mineral patent, last worked under lease during 1953. No record of production then. Previously under development in 1913 to 1914. About 30 st of high-grade lead-zinc ore stockpiled from the inclined shaft (DR77) was reported stolen from the property after lessees abandoned it in 1914 (J. R. Hubbard, no date, p. 3).

SIZE AND ORIENTATION OF THE DEPOSIT. The deposit is not exposed at the surface; the following description is from J. R. Hubbard, a mining engineer who owned the property when the development work was done (1913-1914). The inclined shaft (adjoining DR77) was driven on a 2-ft-wide high-grade seam of lead-zinc sulfide minerals [possibly in either schist or limestone], continuous to a depth of 50 ft in the inclined shaft [trend of the inclination is possibly due west (Arndt, 1956b, p. 2)]. While this seam generated the 30 st of high-grade material reported mined from the inclined shaft, it is not the primary resource target on the patent.

The primary resource target on the property is entirely at depth. It was intersected at about -20 ft in the vertical shaft (DR78-79) and is continuous at the shaft bottom (-85 ft). Drifting from the shaft bottom, to the north [or, more likely to the northwest (Voelzel, 1942, p. 17, fig. 11)], showed continuous low-grade lead-zinc mineralization for 125 ft, at the point where a quartzite dike is intersected. Perpendicular crosscuts at the -85 ft level, at unspecified distances off the 125-ft-long drift, apparently showed a minimum 150-ft-wide continuity to the lead-zinc mineralization. The vertical, 85-ft-deep shaft and 150-ft-total crosscutting all stopped before the margin of the deposit was reached (J. R. Hubbard, no date, p. 2). A report of igneous intrusion immediately south of the vertical shaft suggest a southern perimeter of the deposit.

Using the above data, a 125-ft-long, 150-ft-wide, and 65-ft-thick (minimum) deposit is suggested. This could contain about 100,000 st (based on 1,219,000 ft^3 of rock). Hubbard estimated 40,000 st in this same area of the property. These resources are inferred.

MINERALOGY, GRADE. In general, about 4% lead and 1% to 2% zinc are in the mineralized rock. Numerous assays have been reported:

Assay reported by:	Pb	Zn	Cu	Other	Location
Johnson (1951c, p. 1)	5%	2%	0.05%	2 oz Ag/st	Dump, shaft DR78-79
Johnson (1951c, p. 1)	1%	1%	0.05%	-	Open cut DR76-77, top of schist below alluvium.
Johnson (1952b, p. 2)	6.67%	1.91%	0.33%	0.67 oz Ag/st	50 lb high-grade from dump DR78-79.

J. R. Hubbard (no date, p. 3)	4%	4%	-	-	
Arndt (1956b, p. 2)	4.9%	2.0%	tr	0.6 oz Ag/st	High-grade stockpile north of inclined shaft/open cut (DR76-77)
Sim (no date, p. 2)	5%	2%	0.0035%	1.5 oz Ag/st	Composite of all mineralized rock at the mine.

Note: USBM sampling verifies elevated lead concentrations (>1%) in most samples, and >1% zinc in one sample from the Rainbow patent.

DEVELOPMENT POSSIBILITIES AND PROBLEMS. Development did not occur in 1914, only because suitable lease arrangements could not be made. The tonnage suggests a possible exploration target. The grades are low. The most abundant element, lead, is the lowest-priced commodity of the major base metals.

There is no record of drilling or geophysical investigations. Running geophysical surveys (I.P. and ground magnetometer) over the property would be the most economical way to verify some areal extent to the deposit. If favorable results are obtained, drilling at selected sites could be cored for assay.

MINING HISTORY. The mine was discovered about 1911, with a shallow shaft at the site of the later-excavated inclined shaft (DR77). The claims were acquired by James R. Hubbard in 1912. Early in 1913, Hubbard leased the property to Granby Mining and Smelting Co, St. Louis, MO, a firm with a lead smelter in Granby, MO, and zinc smelters in East St. Louis, IL, and Neodesha, KA at the time.

During 1913, Granby Mining deepened the discovery shaft (DR77) to 50 ft, following a high-grade lead-zinc seam, just 2-ft-wide. About 120 ft SW. of the inclined shaft, Granby sunk an 85-ft-deep vertical shaft, which showed mineralized rock from -20 ft to the bottom. Granby ran a 125-ft-long drift northward on the -85 ft level to the northern end of the deposit, and their crosscuts at the -85 ft level, perpendicular to the 125-ft-long drift, showed continuous mineralized rock. At some point, Granby connected the inclined shaft to the vertical shaft-crosscut workings (J. R. Hubbard, no date, p. 1-3, enclosures 4, 5).

Granby Mining and the claim owner, J. R. Hubbard reached an impasse in 1914. Granby wanted to delay payment on their lease, due to the necessity of purchasing pumping equipment to remove the significant flow of water into their workings. Hubbard, reasoning that the firm had spent about $18,000 on the property in the previous year, felt that the cost of pumping equipment was not a large enough expense to justify delay of payment. The two never resolved the issue, and the mine flooded (J. R. Hubbard, no date, p. 1, 2). No production took place.

The patent (mineral survey 4006) was surveyed in 1926.

At some point, a 20-ft-long, SE.-trending drift was driven at the -60 ft level from the vertical shaft (Johnson, 1951c, p. 1, 3).

A five-year lease to Chester Higgins, Benson, AZ, and Peter Lehr, Anaheim, CA (1951-1956) did not result in any production from the mine. The open cut that adjoins the inclined shaft (DR76-77) was made by sub-lessee, C. J. Frankel, Hereford, AZ. The excavation was continued east of the wash. Frankel applied for Federal funding under the D.M.E.A. program, but money was not granted for this work. Frankel had abandoned the work by 1953 (R. M. Hubbard, 1981a, p. 2).

Ownership, as of 1980, was the estate of Mrs. Flora Hubbard, widow of James R. Hubbard.

DR80-91

Buena Vista Mine (fig. 46)

a.k.a. Horse Fall Mine, although it is possible that the Horse Fall name applies to the Good Hope/Barnes workings (Naoe claims) to the east.

SUMMARY. Fractured and brecciated limestone intruded by granite. Skarns at two levels of drifts demonstrate presence of zinc in skarn.

PRODUCTION AND STATUS. No record of any mining since 1937.

Production:

1914	32 st
1937	43 st.

(Source: USBM-IFOC files)

SIZE AND ORIENTATION OF THE DEPOSIT. A depth of about 170 ft is suggested (between adits DR82-87 and DR88-89, but no appreciable strike length can be assigned to the skarn (50 ft, maximum, with known data), and the skarn, where exposed is thin (about 3-ft-wide). This suggests about 2,000 st (based on 25,500 ft^3 of rock). A deposit of such low tonnage could not be developed for zinc under 1993 economic conditions. The heavy faulting makes even that low tonnage suspect, because the continuity of fault-ridden skarns is highly suspect, and there is little structural control on the deposit from exposed workings and outcrop.

MINERALOGY, GRADE. Zinc, probably ZnS, in skarn. Three samples contain >3% Zn, >2% Zn, and 1.8% Zn.

DEVELOPMENT POSSIBILITIES AND PROBLEMS. Development unlikely, based on known data. Deposit is likely very low tonnage.

MINING HISTORY. Unknown. Production figures suggest only two years of mining.

TAILINGS AND DUMP. No milling was done on the property. Dumps: see sample descriptions.

REMAINING EQUIPMENT. None.

MINE HAZARDS. Minor falling hazard at winze in upper adit (DR82-87); also loose rock in mine back there, NE. drifts.

DR92-95

Burrito de Fierro Mine (fig. 46)

SUMMARY. Outside National Forest. Data were gathered during 1980 USBM RARE II study. Lead and zinc mineralization in a brecciated zone; less than 100 ft of drifting on one level.

PRODUCTION AND STATUS. Current (1992) status not known. Mining records:

1956	45 st
1958	32 st
1959	76 st
1960	34 st
1964	46 st

Total recovered metals (recorded) are 5,900 lb lead, 800 lb zinc, 1,303 oz silver, 100 lb copper. However, these recorded totals are known to be incomplete, and may represent less than 20% of the actual total recovered metals from this mine.

[Source: USBM-IFOC files].

SIZE AND ORIENTATION OF THE DEPOSIT. See mine map. No data on deposit extent.

MINERALOGY, GRADE. Base metals, probably occur as sulfides, along fault zone in limestone, with some evidence of silication of the limestone. Lead and zinc are the most concentrated metals, but zinc is mostly less than 3%. Copper concentrations are low.

DEVELOPMENT POSSIBILITIES AND PROBLEMS. Not enough data. Grades presented in assays and the production figures suggest that none of the metals copper, lead, zinc, or silver, are in concentrations high enough for economic consideration.

MINING HISTORY. Unknown.

TAILINGS AND DUMP. Dumps on property (see mine map); no data on their size or composition.

REMAINING EQUIPMENT. None reported.

MINE HAZARDS. None reported.

DR96-110

Hubbard Mine (fig. 5, and mine map: fig. 47)
a.k.a. Democrat Mine (because most of the workings are on the Democrat mineral patent), or Democrat & Sherman Mine (because the two adjoining mineral patents, on which all the workings lie, are called "Democrat" and "Sherman").

SUMMARY. Highly-concentrated sphalerite replacement skarn with strongly fault-controlled emplacement in limestone. One adit with stoping, one barren crosscut adit, and one shallow discovery shaft on the Democrat patent; one short adit and adjoining short inclined shaft on the Sherman patent.

PRODUCTION AND STATUS. Inactive since 1952. Production:

1943	237 st	19.53% Zn, 0.68% Pb, 1.33 oz Ag/st, shipped to Shattuck-Denn mill, Bisbee, AZ.
1944	256 st	Apparently shipped to American Smelting and Refining Co. smelter in Deming, NM; average grades (apparently for 1943 *and* 1944 shipments): 25.00% Zn, 1.00% Cu, and 2.00 oz Ag/st.
1949	35 st	
1952	41 st	19.95% Zn, 0.20% Pb, 0.28% Cu, 0.50 oz Ag/st; shipped to American Smelting and Refining Co., Deming, NM.

Sources: Tonnage totals for 1943, 1944, 1949 from USBM-IFOC files; all other data from Arndt (1956a, p. 3).

SIZE AND ORIENTATION OF THE DEPOSIT. In the upper adit of the Democrat patent, one enriched sulfide zone (DR97-100), N. 55° W., SW. 89° mostly, SW. 60° in the northwesternmost extent. This zone is 4.5-ft-wide in most of its strike length (100 ft), but 6.5-ft-wide in its northwesternmost 12 ft. Also on this level, 16 ft to the SW. of zone DR97-100, is a skarn, 6.5-ft-wide, and exposed for 50 ft along strike (DR101-102); orientation is N. 63° W., SW. 55°. These zones are not present 75 ft down dip in the crosscut adit. Above the upper level, the mineralized structures reach the topographic surface. In the Sherman patent, a short inclined shaft exposes another skarn, N. 35° W., NE. 88° and 15-ft-thick. It is not found in outcrop above the inclined shaft. Strike length is at least 30 ft, based on descriptions of the working; it was flooded to the collar in Aug. 1992.

MINERALOGY, GRADE. Very high-grade zone contains about 20% Zn (in sphalerite). Non-economic quantities of copper, lead, silver, and gold are present. Most of the visible minerals are calc-silicates and sphalerite. Life-of-mine averages of grades were reported as Zn, 18.10% to 21.00%; Cu, 0.10% to 1.15%; Pb, 0.04% to 0.50%; Ag, 0.50 oz/st to 2.00 oz/st; Au, 0.002 oz/st to 0.005 oz/st.

DEVELOPMENT POSSIBILITIES AND PROBLEMS. The apparent pinch-out of the ore zone less than 75 ft down dip from the main working (upper level, Democrat patent) is discouraging; also, the ore zone in that working is mined out to the SE., and faulted to the NW. (DR97 area). This is apparently the late, NE.-trending cross-faulting described by Cederstrom (Arndt, 1956a, p. 3). The main mined zone has not been fully exposed on the NW. extent. The Sherman patent skarn also appears to be limited in areal extent. Extensive talus and soil cover

MINING HISTORY. At some unknown date, apparently years prior to 1937, the area was part of several "Fourr" mining claims, with some unspecified amount of high-grade lead ore produced. Later, again at an unknown date, a Mr. Barnes produced 3 st of lead-zinc ore from sulfide "kidneys", and abandoned the property and the production, leaving $150.00 in unpaid debts. At that time the site was called the Barnes Mine. Lee Haney, of Barstow, CA, apparently sometime in the 1930's, re-staked the claims and the mine became known as the Good Hope Mine. He removed Barnes' production from the property and held the claims until at least 1952. E. J. Bartell, Dragoon, AZ, held a lease on the property from Haney in 1952, and planned to produce lead-zinc ore. Bartell also was considering applying for a Federal Government DMEA exploration loan to develop the property (Lerchen, 1937a, p. 1; Johnson, 1952a, p. 1). There is no record of any production by Bartell. By 1974, John Bettoni held the claims, then known as "Naoe". Other than road improvements, there is no record of any mine-related activity by him. (USDA, Forest Service files, 1974, Douglas, AZ). Bettoni apparently was involved with the property into the 1980's, but Bureau examinations in 1989 and 1991 found no evidence of recent activity at the site.

TAILINGS AND DUMP. No milling was done on the property. Dumps: see sample descriptions.

REMAINING EQUIPMENT. Several trucks, other equipment, parked together at the upper part of the road (as shown on the 7.5 minute topographic map); the road, in reality, continues farther up the hill to the lowest mine adit. Adit DR113-117 has an "A-frame" tram support on the dump; from there, cable extends down to the road, about 250 ft below.

MINE HAZARDS. Shaft at DR112 apparently drops all the way down to adit DR113-117 (USDA Forest Service files, 1975, Douglas, AZ).

DR121-129

Seneca Mine (fig. 41, and mine maps: fig. 42-43)
a.k.a. Senecia Mine, Senika Mine, Lewis Group, LeRoy Mines Co. (Keith, 1973, p. 64).

SUMMARY. Limestone of the Naco Group has been intruded by a NE.-trending band of Tertiary, granitic rock (Drewes and Meyer, 1983, map) and faulted. A skarn, as much as 10-ft-thick, has formed along this contact with Tertiary rock. In accessible workings, few carbonate rocks are exposed. Tertiary granitic rocks can be in either the footwall or hangingwall (sometimes both) where the skarns are exposed by mine excavations. Significant copper, lead, silver, and zinc is in USBM samples collected from the workings.

PRODUCTION AND STATUS. Produced zinc ores, with byproduct lead, in early 1940's, from a 40-ft-long adit in limestone (Mahoney, 1942b, p. 2). Most likely, this was the DR125-126 adit, now caved. Based on size of the upper adit (DR122-124), more production probably took place in the 1940's than what was recorded; at least 1,000 st of skarn was removed from the DR122-124 adit, based on the size of the workings, which are entirely within skarn. The winze in DR122-124, designed to drop ore a considerable distance vertically, no doubt shunted the ore to the lower level (adit DR125-126), which would have to be extended considerably beyond 40 ft in length to received this ore. The lower level was completely caved during a Sep. 1991 evaluation of the site. Still, it is unlikely that any more than a few thousand st was mined here, because the target was lenticular masses of high-grade sphalerite (Wilson, 1951, p. 26). High-grading results in low tonnage produced. Also, the dumps at the mine site are not large.

Recorded production:

1942	110 st	Probably from adit DR125-126. Shipped to Shattuck-Denn mill in Bisbee, AZ; 35% Zn, 5% to 6% Pb, and "a little" copper. Mined by D. H. Lewis, A. Skinner, and a Mr. Campbell, of Willcox, AZ (Mahoney, 1942b).
1943	216 st	Shipped to Shattuck-Denn mill in Bisbee, AZ; 25% Zn, 5% Pb, 1.5 oz Ag/st. Mined by C. B. Lancaster and R. D. Brooks (Wilson, 1951, p. 26).

SIZE AND ORIENTATION OF THE DEPOSIT. Field examinations found skarn at the DR122-124 adit, the DR127 adit, and the DR128-129 adit. Between the DR122-124 adit and the DR127 adit, the skarn is cut by a N. 30° W.-striking, possibly high-angle fault. The uplifted side of the fault is assumed to be the DR127 side, based on the elevation difference between DR122-124 skarn and the DR127 skarn. At DR127 adit, the skarn is much thinner (9-ft-wide average to 3-ft-wide). At DR128-129, the skarn is badly broken into small blocks by faulting, and probably no longer is a minable unit due to this consistency. Grade there decreases also.

Adit DR122-124 demonstrates down-dip continuity of the skarn for 250 ft. The strike length is less certain. The unit is eroded SW. of DR122-124. Assuming the skarn continues from DR122-124 to a point halfway between DR127 and DR128-129, a strike length of 250 ft is warranted. The faulting between DR122-124 and DR127 is ignored for this estimate. An average width is 6-ft, from measurements at DR122-124 and DR127. These spatial estimates lead to a tonnage estimate of 375,000 ft^3 of rock, or about 31,000 st.

There is a distinct possibility that the DR125-126 adit was in a different, lower skarn horizon than is the DR122-124 adit.

MINERALOGY, GRADE. Calc-silicate minerals in the skarn predominate. Zinc and lead sulfides and pyrite were in the ores (Wilson, 1951, p. 26). USBM samples:
4 exceed 1% Cu, 6 exceed 1% Pb, 5 exceed 1% Zn, and 2 have 5.8 oz Ag/st or more.

DEVELOPMENT POSSIBILITIES AND PROBLEMS. Re-running the samples at ore-grade level assays for copper and lead would be helpful in characterizing the deposit. This was not done due to time constraints. PREVAL modeling of the inferred 31,000 st deposit suggests it could not be mined at a profit.

MINING HISTORY. The claim was staked in 1916 and abandoned. In 1942, Lewis, Skinner, and Campbell of Willcox, AZ, re-staked the claim and were mining. They appealed to the Federal government, as they could not find a buyer for their mined, high-grade zinc ores, but later found that the Shattuck-Denn mill in Bisbee, AZ would take the shipment. Apparently, the only working was the DR125-126 adit, which was 40-ft-long and had a shaft of greater than 12 ft depth at the portal (Mahoney, 1942b, p. 1, 2).

In 1943, new operators were Lancaster and Brooks, who shipped 216 st of high-grade zinc ore to the Shattuck-Denn mill.

It is not known when the DR122-124 adit was driven, or how much ore was removed from it.

The date of last mining at the site is not known.

TAILINGS AND DUMP. No milling was done on the property. Dumps: combined are less than 1,000 st. See sample descriptions.

REMAINING EQUIPMENT. None.

MINE HAZARDS. Adit DR122-124 is dangerous. The sill was cut down to a narrow channel along a 34° slope and lined with sheet metal to shunt ore into a vertical winze with a grizzly on top. Grizzly breaker spacing is 1 ft. A person could easily slide down this "chute" and hit the grizzly. It is not known if the breaker bars (logs) are strong enough now to support a person's weight. The adit also has about a 50-ft-long length of drift wherein the ribs are far apart and the back is in poor condition due to hanging rock slabs. In many places, the vertical timber sets in this part of the adit no longer reach from sill to the back, leaving the mine with essentially no support.

DR130-149

St. Francis Mine and Pittsburgh-Manhattan mineral patents
(fig. 44-45)

Note: the western part of this area is the Pittsburgh and Manhattan mineral patents. Permission was granted to the USBM to examine the patents in 1980 (one sample collected then was re-assayed in 1992). Owners gave no response to the USBM requests to examine the patents in 1989 for the Coronado National Forest study. Without access permission, no further work could be conducted on the patents.

SUMMARY. St. Francis: Granite, limestone, silicified limestone, and marble crop out in the claim group. The area is heavily faulted. The granite, mapped as Precambrian (Drewes and Meyer, 1983, map), shows evidence of alteration that is continuous with silication zones in lower Paleozoic marble (mine area DR137-142). If the ages are correct, the most likely scenario is that Tertiary alteration followed faults through older rocks. Most lithologic contacts are faulted, as are most mineralized zones. Pittsburgh and Manhattan patents: no data.

PRODUCTION AND STATUS. No production is known. Current claim status is not known. The St. Francis claims, the only staked claims in the area for which we have any information, have not been active since about 1981 (USDA, Forest Service files, unpub., Douglas, AZ). Pittsburgh and Manhattan patents: no data.

SIZE AND ORIENTATION OF THE DEPOSIT. St. Francis: the specific granite-carbonate, faulted contact zone is about 3,400-ft-long (Drewes and Meyer, 1983, map). The sulfidized zones in this area are exposed for the greatest length along strike at the DR143-149 adit: 115 ft along strike (about 30 ft down dip). The DR143-149 sulfidized zone was mined for about 1,200 st (based on 13,800 ft^3 of rock excavated from the adit), at an average width of 4 ft. The excavations in the upper adit, DR137-142, removed a 5-ft-wide mineralized zone for 45 ft down dip, and 60 ft along strike. This amounts to 1,100 st (based on 13,500 ft^3 of rock). The heavily-fault-controlled nature of the occurrences increases the likelihood that they are not continuous structures, but are instead faulted out. Tracing the structures beyond the workings was not possible due to talus and vegetation.

MINERALOGY, GRADE. At adit DR137-142, zinc is elevated (1.5%) and copper exceeds 1% in one sample. The low metal concentrations in the other samples suggests that DR142 concentrations are from secondary enrichment. The lower adit (DR143-149, has much higher metal concentrations. Zinc exceeds 3% in all samples of the mined zone; lead exceeds 1% in five of the samples. Copper, silver, and gold are elevated, but not to economic levels. The upper detection limit in the reconnaissance-level assaying used on these samples was in most cases, exceeded for lead and zinc. Kreidler (1981, map) assayed many of these samples at ore-grade levels, demonstrating a zinc concentration of 3.0% to 12.4% and a lead concentration of 1% to 2%. Zinc averaged only slightly more than 3%.

DEVELOPMENT POSSIBILITIES AND PROBLEMS. The structures do not have any known appreciable continuity. This is due mostly to the fact that talus cover is significant. The smaller structures on the properties, or those for which no continuity whatsoever can be demonstrated (DR130-136), have no metal concentrations high enough to suggest resources are present. The structures DR137-149, to which some size estimate can be assigned, are: 1) small, 2) faulted and thus likely not continuous, 3) of very low grade (DR137-142) or low grade (DR143-149). It is not likely that mineral development interests will seek a zinc-lead property where neither commodity reaches average concentrations of 5%.

MINING HISTORY. No data for Pittsburgh-Manhattan patents. St. Francis: largely unknown. The excavations certainly predate the staking of the St. Francis claims [the claims were staked by 1974 (ADMMR files, unpub., Phoenix, AZ). Manuel Hernandez, of Pearce, AZ, was apparently the originator of the St. Francis claims. He submitted several plans to develop the property. In 1974, Bolsa? quartzite on the property was of interest for small amounts of gold (0.02 oz/st to 0.03 oz/st). The material was investigated for smelter flux (providers are paid for the precious metals content of the flux). There was no production of the 85% SiO_2 rock.

In 1978, Hernandez and Marvin Dunagan of Willcox, AZ under the name Coronado Marble Co. of Arizona, Sunsites, AZ, drilled the limestone on the property at four places (collar locations not known), demonstrating 85% to 95.5% $CaCO_3$ in the Escabrosa Limestone. This investigation was for chemical grade limestone. The plan was to open-pit quarry the limestone and sell it to the Apache power plant, several miles to the northeast (Cochise, AZ), for use as an emissions scrubber. A power plant in St. Johns, AZ, was another potential market. The claims essentially were staked over top of the Pittsburgh and Manhattan patents. No production resulted (USDA, Forest Service files, Douglas, AZ).

In 1980, the Granite Bluff claims were staked over top of the St, Francis claims by Ray Compton and Ralph Maynard. At the time when silver had reached record highs in the US, they wanted to mine silver from mineralized faults (some are exposed in the old adits). No production resulted (USDA, Forest Service files, Douglas, AZ).

In 1981, an examination of the St. Francis claims showed no activity was underway (USDA, Forest Service files, Douglas, AZ).

TAILINGS AND DUMP. No milling was done on the property. Most dumps are very small or incorporated into the exploration drill road that cuts through the claim area. Measured dumps are discussed in sample descriptions.

REMAINING EQUIPMENT. None.

MINE HAZARDS. None.

DR151-154

Discovery #1 prospect. Name from Perry (1964, fig. 2). See fig. 28, and mine map (fig. 30).

SUMMARY. Sphalerite laminations in skarn/limestone/marble bed. Probably northern extension of Abril Mine skarn. Three short adits.

PRODUCTION AND STATUS. Inactive; production of hand-sorted ore possible, unknown.

SIZE AND ORIENTATION OF THE DEPOSIT. The 34-ft-thick skarn was mined for a 5-ft-thick interval with sphalerite, but more rock of equivalent grade was left in place for roof support. The shallow-dipping skarn (NE., 14° to 20°) has a NW. strike. It crops out for 85 ft along strike, lost in marble talus both to the north and south, but other exposures suggest it is continuous for about 160 ft along strike. Down dip, it is exposed for 120 ft, then lost in caving near the adit face.

MINERALOGY, GRADE. Low-grade zinc (maximum 0.11% Zn) in sphalerite-bearing skarn. Negligible silver, copper, lead. No gold.

DEVELOPMENT POSSIBILITIES. Grades are too low for economic consideration. Possible strike extension of the zone to the SE. is suggested by the location of the Plainview mining claim, shown in Perry (1964, fig. 2) as a prospect pit. A search for this site in July 1992 revealed only rock talus on a very steep, west-facing slope. It is possible that mass-wasting in the nearly thirty years since Perry visited the site has obliterated the pit, or it could have been merely concealed in brush.

MINING HISTORY. Discovery #1 staked in October 1945 by the Abril brothers and H. W. Smith (Perry, 1964, p. 4). Plainview claim, a "small prospect pit", was staked by J. M. Wilson, R. M. Wilson, and Reese Maddox in July 1957 (Perry, 1964, p. 5).

REMAINING DEPOSIT/ORE. No ore known. Moderate tonnage of skarn in the ground (50,000 st) is likely, but the four samples collected represent a "cross-section"-type test of zinc content; analytical results to not suggest further economic consideration is warranted.

TAILINGS AND DUMP. No tails; dump has mass-wasted down the very steep, west-facing slope on which the prospect was excavated.

REMAINING EQUIPMENT. Rail throughout the DR153-154 adit is made of split tree limbs with iron facing. This was used to drag a wooden ore bucket (supported with iron rings and bail) up the low-angle incline of the adit. Bucket on dump. In fairly good condition. Wheel barrow (all iron, including wheel) on dump; rusted.

MINE HAZARDS. None.

DR155

Unnamed prospect (fig. 28)

SUMMARY. Sphalerite-bearing skarn cuts marble. Probably Abril Mine type skarn. Shallow pit, very heavily overgrown.

PRODUCTION AND STATUS. Inactive; production of hand-sorted ore possible, unknown.

SIZE AND ORIENTATION OF THE DEPOSIT. The exposed skarn is 8-ft-thick, but both margins are covered. Its outcrop cannot be traced along strike, as visibility is only 10 ft here and brush is very thick.

MINERALOGY, GRADE. Low-grade zinc (0.02% Zn) in sphalerite-bearing skarn. Negligible silver, copper, lead. No gold.

DEVELOPMENT POSSIBILITIES. Grades are too low for economic consideration. Twin shafts (one 40-ft-deep) were found approximately on strike, 212 ft NW. of the DR155 pit (Anaconda Geol. Document Collection, document 131109, no date; Perry, 1964, fig. 2). This may be an extension of the DR155 zone. These shafts were searched for in July 1992, but could not be found in the thick brush.

MINING HISTORY. Unknown.

REMAINING DEPOSIT/ORE. No ore known. Limited exposure prevents size estimate.

TAILINGS AND DUMP. No tails; dump size negligible.

REMAINING EQUIPMENT. None.

MINE HAZARDS. None.

DR156-166

Abril Mine (fig. 28, and detailed mine map: fig. 29)

SUMMARY. A thick skarn through Naco limestone has been mined for about 70 ft down dip. Production has been an estimated 8 million lb zinc with byproduct copper, silver, and lead. Production was almost entirely with Federal Government assistance: 1) capitalizing the mine in 1943; 2) building a upper road from the mine to Sorin Gulch so that ore could be taken out in a way other than the Slavin Gulch trail; 3) paying premiums on zinc during the entire productive period of the mine; and 4) recapitalizing the mine again and funding half of the exploration during the Korean War-era quest for zinc properties to develop.

PRODUCTION AND STATUS. Inactive since 1953 when Federal financing for mining expired; much of the workings are accessible (July 1992).

Production (***WHERE INFORMATION FROM CONFIDENTIAL USBM SOURCES HAS BEEN WITHHELD, COLUMN IS ANNOTATED "W"***):

Year	Tons (st)	Avg. grade	Metals	Producer
1903-1943	2,200 (est.)	W % Zn W oz Ag (est.)	W lb Zn W oz Ag	Herrera/Abril Bargin Mines, Inc.
1944	120 st	W % Zn W oz Ag (est.)	W lb Zn W oz Ag	Skinner/Lewis
1945	1,614	23% Zn	500,000 lb Zn	Bargin Mines, Inc.
1946	7,123	W % Zn W % Cu W % Pb W oz Ag	1,523,000 lb Zn W lb Cu W lb Pb W oz Ag	Shattuck-Denn
1947	9,990	W % Zn W % Cu W % Pb W oz Ag ?	2,435,910 lb Zn 188,162 lb Cu 12,735 lb Pb 3,058 oz Ag 26 oz Au	Shattuck-Denn
1948	1,214	W % Zn W % Cu W % Pb W oz Ag	W lb Zn W lb Cu W lb Pb W oz Ag	Shattuck-Denn
1949	2,661	W % Zn W % Cu W % Pb W oz Ag	W lb Zn W lb Cu W lb Pb W oz Ag	Shattuck-Denn
1950	0			
1951	5,427	W % Zn W % Cu	W lb Zn W lb Cu	Sherwood Owens

Production (contin.):

Year	Tons (st)	Avg. grade	Metals	Producer
1952	1,605	W % Zn W % Cu	W lb Zn W lb Cu W lb Pb W oz Ag	Sherwood Owens
1953	139	No data	W lb Zn	Sherwood Owens
Totals	30,794		7,985,907 lb Zn 387,522 lb Cu	

(Sources: Wilson, 1951, p. 23; Farnham, 1954, p. 5; Owens, 1954?, p. 6; Perry, 1964, p. 4-5).

NOTES: Owens (1954?, p. 6) reports 8,762.74 st (dry) produced in 1947.

Zinc metal production for 1945, and 1946, and production of zinc, copper, lead, silver, and gold metals in 1947 are recovered quantities.

SIZE AND ORIENTATION OF THE DEPOSIT. The deposit, a layer of skarn in the lower 70 ft of a 570-ft-thick limestone bed (Wilson, 1951, p. 23) that is probably Naco limestone (Farnham, 1954, p. 1), strikes N. 20° W. below level 2, and dips NE. 40° to 45°. At level 2, and above, it strikes about N. 20° W., and in places dips to the south. The mined skarn zone averages 50 ft in strike length on level 4, about 150 ft in strike length on level 3, and about 75 ft in strike length above level three to the point where it is first encountered, some 50 ft below the level 1 adit (see map). A second zone of skarn development occurs down dip (see DR159, 160-161, level 4, and Raise 60, level 4), but these skarns are low in tonnage (150 st to a few thousand st). The reference to the Igo No. 3 shaft (Lerchen, 1937b, p. 2) suggests more skarn development on the same down dip trend as DR159, 160-161, and Raise 60. None of that material, from interpretation of old literature, was ever mined due to low grade.

The skarn averages 15 ft in thickness, though probably reached 30 ft in places.

The limestone in which the minable skarn has formed, is underlain by quartzite that is 25- to 100-ft-thick, and the entire sedimentary mass is underlain by granite of the Stronghold batholith (Wilson, 1951, p. 24). A fault of the same orientation as the mined deposit cuts the sedimentary rocks (Woodcock, 1990, p. 2; Wilson, 1951, p. 24, 26), with the limestone and skarn above and adjacent to the fault plane.

MINERALOGY, GRADE. Sphalerite and chalcopyrite in epidote and garnet (and calc-silicates) gangue, with grades averaged from total production of 12% zinc, 0.70% copper, 0.06% lead, and 0.35 oz silver/st (Farnham, 1954, p. 1; Woodcock, 1990, p. 1).

Galena is a lesser constituent, and the silver form is unknown. Also identified were molybdenite and yellow molybdenum oxide (Wilson, 1951, p. 26). Geochemically anomalous bismuth was reported from assays (Woodcock, 1990, p. 2).

DEVELOPMENT POSSIBILITIES/PROBLEMS. Ore from the known deposit has been mined out, with few exceptions. The mineralized zone above level 4 (see sample locality DR159) contains about 1,200 st of 5.0% Zn. Below level 4 (see locality DR160), drilling by Shattuck-Denn intersected 17 ft of 11.67% Zn, but no winze was ever sunk to expose the mineralized rock (Farnham, 1954, p. 2, 11). That zone, if continuous along the entire strike length of the skarn exposed on level 4 (DR160-161), would be 125 ft long on strike, and 17 ft wide. It could be no more that 100 ft long down dip, according to drilling records that show its absence down dip (Owens, 1954?, p. 16). This suggests an inferred resource of about 16,000 st at the maximum *below* the DR160-161 skarn. This material is subeconomic: PREVAL estimated losses if this rock were mined are $72/st of ore mined.

Also discouraging is the mine's inability to profit without Federal Government price premiums on zinc.

MINING HISTORY. Ten mining claims for the property were located in 1903 by Frank Abril and Jose and Marcos Herrera because of surficial silver deposits that were found. Work was slow and all equipment had to be brought in by burro (Owens, 1954?, p. 5). No production is known from that time.

By 1937, ownership of five of the ten claims was by Jose Herrera and Manuel R. Abril; the other five were owned by Jose Herrera and Mrs. John Igo; Eagle-Picher Mining and Smelting Co., of Tucson, was assessing the property. By that time, underground excavations had been completed by the owners, including the 400-ft-long Igo No. 3 inclined shaft which followed the skarn zone along limestone stratification. High-grade pockets of sphalerite, chalcopyrite, and galena were seen in the Igo No. 3 shaft, but most of the material was described as "very low grade". The location of Igo No. 3 shaft is most likely the sealed shaft at the same elevation as the Abril Mine level 4, which means the shaft most likely trends NE. on a dip of about 40° for 400 ft. No map of that shaft is known. Other workings described are an Igo No. 2 shaft (location unknown, and the northwest-trending Dos Hermanos adit with connecting winze and crosscuts (Lerchen, 1937b, p. 1-2). This work had to be on levels 1 and 2, based on Owens' (1954?, p. 5) statement that the only mining prior to 1946 was on the level 1 and 2. Reference to the deep, inclined Igo No. 3 shaft disappeared from all literature concerning the Abril Mine written after 1937. A few thousand tons of ore were stockpiled at the time of Lerchen's examination (Lerchen, 1937b, p. 2).

There was apparently little mining accomplished until 1943. The property was owned by Jim and Manuel Abril, brothers, of Superior, AZ and Tombstone, AZ, respectively, and also Hal W. Smith, Tombstone Marshall, and Mrs. Francisco Martinez of Tombstone (Voelzel, 1942, p. 16; Wilson, 1951, p. 23), and they leased it to Bargin Mines, Inc., owned by W. Sim and Mrs. H. Miller (Wilson, 1951, p. 23). Bargin Mines, Inc. obtained a $15,000 RFC (Reconstruction Finance Corp.) loan and went to work, but their mining was not successful (Knight, 1967, p. 1). Then sub-lessees Adrion Skinner and Dan Lewis mined during 1944, producing 120 st of high grade zinc ore, but couldn't get the ore off the mountain (Perry, 1964, 2, 4; Knight, 1967, p. 1). Access at the time was through Slavin Gulch which intersects the property well below any of the mine workings. A map from November 1944 shows only about 400 ft of drifting, total. Level 1 and its 50-ft-deep winze was completed; level 2 drift was completed to the place were the stopes now begin, and some drifting along the upper part of the eventually stoped structure was done. Level 3 was less than 100 ft long from the portal. The shaft opening to the surface from level 3 (see map) was, at the time, a winze that dropped into about 100 ft of drifting (ADMMR files, 1944).

The Federal Government built an access road (cost unknown) from the south in 1945; it now (1992) passes the level 4 portal and is still is good condition with the exception of about 50 ft that is washed out to a narrow width by a gully. Bargin Mines, Inc. shipped

1,614 st zinc ore to the Shattuck-Denn mill in Bisbee, AZ (Wilson, 1951, p. 23), apparently after the road was completed. By December 1945, Shattuck-Denn Mining Corp. took the lease option and began extensive excavation and drilling. Their production of 1946 to 1949 was milled at their Bisbee site until June 1949 when the Federal premium on zinc was discontinued, and Shattuck-Denn responded by ceasing production, and stripping the mine of all equipment (Wilson, 1951, p. 23; Farnham, 1954, p. 5).

Sherwood Owens and American Smelting and Refining Co. (A.S.R.C.) leased the site from Shattuck-Denn in late 1950 in response to metal price increase during the Korean War (Knight, 1967, p. 1; Farnham, 1954, p. 5; Wilson, 1951, p. 23); then, Owens applied in early 1951 for Federal assistance under the amended Defense Production Act of 1950. The Government responded by approving expenditure of $63,926 (Exploration Project Contract I-DMA-E210: 50% capitalization by the Federal Government and 50% capitalization by Owens) without a field examination of the site. Work at the mine ran from December 1951 until contract funds were exhausted in July 1953 (Farnham, 1954, p. 1), and consisted mostly of new drifting on levels 4 and 5 (see map) and drilling from levels 3, 4, and 5. No new ore was discovered, but production did take place in 1951, 1952, and 1953 as a result of this Federal financing. The ores went to A.S.R.C.'s mill in Deming, NM (Knight, 1967, p. 1).

A statement from Knight (1967, p. 1) suggests that the possibility of further mining was entertained during 1954, and that a shortage of interested manpower from Tombstone, AZ was a detriment.

One of Howard Birchfield's old "no trespassing" signs remains on the door at the portal on level 3, indicating his late 1970's-to-early-1980's prospecting activities on the San Juan Mine and Middlemarch Mine properties ranged also as far north as the Abril Mine. There is no record of any mining accomplished by Birchfield at this site. Birchfield interfered with USBM employees during their assignment to assess mineral resources of the Dragoon RARE II area during 1980, thus preventing them from finishing their assignment. As a result, the Abril Mine was not assessed in the USBM RARE II work (Kreidler, 1981). The absence of an Abril Mine assessment by the USBM in Kreidler (1981) was noted in the files of ADMMR in an entry dated July 29, 1988 (ADMMR files, 1988).

REMAINING DEPOSIT/ORE. No ore known. There are 1,200 st of 5% Zn above the level 4 drift in one pod (a measured resource), and up to 16,000 st of 12% Zn (11.67% Zn used in PREVAL calculations) below the level 4 drift (an inferred resource).

TAILINGS AND DUMP. No tails. Dump dimensions were approximated and converted to tonnage estimates (17 ft^3/st for skarn-rich dumps and 20 ft^3/st for limestone-rich dumps with some skarn). Results were rounded to one significant figure. Several dumps are on the property:

At level 1 portal	500 st (sample DR166)
At level 2 portal	200 st (silicified limestone; no sample)

At level 3 portal	Dump scattered down very steep slope to west; no measurement possible.
At level 4 portal	Two dumps: upper is north of portal, 400 st; lower is erosional material from the upper dump and is about 40 st. Dumps have some sulfide skarn but were not sampled.
At level 4 portal elev., dump from boarded-over shaft (probably Igo No. 3)	Dump is 2,000 st, composed of 90% limestone, quartzite and 10% skarn. No sample.
At level 5 portal	Nearly barren dump of limestone, quartzite, minor sphalerite, chalcopyrite. No sample. Most of dump is eroded down into Slavin Gulch; dispersed and unmeasurable.

REMAINING EQUIPMENT. None. Rail has been pulled from the mine.

MINE HAZARDS. The old shaft that opens into level 3 is an area where surface collapse into the mine workings could occur. A person falling into the shaft from the surface would travel about 20 ft to the level 3 sill, and, if extremely unlucky, could also roll into the open winze cut into the level 3 sill, for a total fall of over 50 ft. The level three portal is easily accessible, thus one could walk into the winze area (on the level 3 sill). The winze is blocked by a length of wire rope stretched across the drift. The wire rope could be easily crossed. Persons entering without adequate light could fail to see to open winze.

The level 2 entrance into the stope is a more minor falling hazard. One could get into this 70° sloped area and have a hard time getting back out, or knock down loose rock from the stope walls in the process. The stope continues northward down dip for at least 50 ft. There is no blockage at the entrance to this stope.

DR167

East prospect. Name from Perry (1964, fig. 2). See fig. 31.

SUMMARY. Thin skarn exposed by trench, adit.

PRODUCTION AND STATUS. Inactive, no production.

SIZE AND ORIENTATION OF THE DEPOSIT. See sample description.

MINERALOGY, GRADE. Weak skarn. Part of trend of skarns south from Abril Mine area.

DEVELOPMENT POSSIBILITIES. Explore area for another Abril Mine-type skarn. Chance of turning a profit is low.

MINING HISTORY. Unknown.

REMAINING DEPOSIT/ORE. No ore known.

TAILINGS AND DUMP. No tails; dump negligible, mostly eroded down gully.

REMAINING EQUIPMENT. None.

MINE HAZARDS. None.

DR168

Unnamed prospect (see pl. 1)

SUMMARY. Pit exposes skarn through limestone conglomerate.

PRODUCTION AND STATUS. Inactive, no production.

SIZE AND ORIENTATION OF THE DEPOSIT. See sample description.

MINERALOGY, GRADE. Weak skarn. Part of trend of skarns south from Abril Mine area.

DEVELOPMENT POSSIBILITIES. Explore area for another Abril Mine-type skarn. Chance of turning a profit is low.

MINING HISTORY. Unknown.

REMAINING DEPOSIT/ORE. No ore known.

TAILINGS AND DUMP. No tails; dump not measured.

REMAINING EQUIPMENT. None.

MINE HAZARDS. None.

DR170

Unnamed prospect (see pl. 1)

SUMMARY. Pit exposes silicated fracture through limestone breccia.

PRODUCTION AND STATUS. Inactive, no production.

SIZE AND ORIENTATION OF THE DEPOSIT. See sample description.

MINERALOGY, GRADE. Weak skarn. Part of trend of skarns south from Abril Mine area.

DEVELOPMENT POSSIBILITIES. Explore area for another Abril Mine-type skarn. Chance of turning a profit is low.

MINING HISTORY. Unknown.

REMAINING DEPOSIT/ORE. No ore known.

TAILINGS AND DUMP. No tails; dump not measured.

REMAINING EQUIPMENT. None.

MINE HAZARDS. None.

DR171-172

Hussar mineral patent (see pl. 1 and mine map: fig. 31)

SUMMARY. Silicated fracture through limestone breccia exposed by adit. Mineral patent map shows an open cut (18-ft by 40-ft, 30-ft-deep) with a 23-ft-deep shaft sunk in it. The cut and shaft are 286 ft SE. of the adit, but were not examined in this USBM evaluation.

PRODUCTION AND STATUS. Inactive, no production.

SIZE AND ORIENTATION OF THE DEPOSIT. See sample description.

MINERALOGY, GRADE. Weak skarn. Part of trend of skarns south from Abril Mine area.

DEVELOPMENT POSSIBILITIES. Explore area for another Abril Mine-type skarn. No evidence of an economic skarn in this area.

MINING HISTORY. The mineral patent was issued in June 1915, following a November 1914 survey, which was done for Thomas R. Sorin, executor of the will of Sarah H. Sorin. Prospect excavations made sometime prior to late 1914.

REMAINING DEPOSIT/ORE. No ore known.

TAILINGS AND DUMP. No tails; dump not measured.

REMAINING EQUIPMENT. None.

MINE HAZARDS. None.

DR173-174

Unnamed prospect (see pl. 1 and mine map: fig. 31)

SUMMARY. Skarn explored by shaft, short levels.

PRODUCTION AND STATUS. Inactive, no production.

SIZE AND ORIENTATION OF THE DEPOSIT. See sample description.

MINERALOGY, GRADE. Mostly epidote. Moderate silver; highest copper in skarn trends south from Abril Mine area (>1%).

DEVELOPMENT POSSIBILITIES. Explore area for another Abril Mine-type skarn. Chance of turning a profit is low.

MINING HISTORY. Unknown.

REMAINING DEPOSIT/ORE. No ore known.

TAILINGS AND DUMP. No tails; dump 200 st (at 17 ft^3/st).

REMAINING EQUIPMENT. None.

MINE HAZARDS. None.

DR175

Unnamed prospect (see pl. 1 and mine map: fig. 31)

SUMMARY. Thin, epidotized fracture in limestone. Short adit.

PRODUCTION AND STATUS. Inactive, no production.

SIZE AND ORIENTATION OF THE DEPOSIT. See sample description.

MINERALOGY, GRADE. Skarn minerals. Highest silver in skarn trends south from Abril Mine area (107 ppm).

DEVELOPMENT POSSIBILITIES. Explore area for another Abril Mine-type skarn. Chance of turning a profit is low.

MINING HISTORY. Unknown.

REMAINING DEPOSIT/ORE. No ore known.

TAILINGS AND DUMP. No tails; dump about 100 st.

REMAINING EQUIPMENT. None.

MINE HAZARDS. None.

DR176

Unnamed prospect (fig. 19, and mine map: fig. 24)

SUMMARY. Thin, non-extensive skarn along a fracture. Short adit.

PRODUCTION AND STATUS. Inactive, no production.

SIZE AND ORIENTATION OF THE DEPOSIT. See sample description.

MINERALOGY, GRADE. Skarn. Low zinc grade.

DEVELOPMENT POSSIBILITIES. See DR183.

MINING HISTORY. Unknown.

REMAINING DEPOSIT/ORE. No ore known.

TAILINGS AND DUMP. No tails; dump negligible.

REMAINING EQUIPMENT. None.

MINE HAZARDS. None.

DR179

Unnamed prospect (fig. 19 and mine map: fig. 24)

SUMMARY. Skarn. Short adit.

PRODUCTION AND STATUS. Inactive, no production.

SIZE AND ORIENTATION OF THE DEPOSIT. See sample description. Geology in DR177-178 suggests a very limited down-dip extent of the skarn.

MINERALOGY, GRADE. 0.53% zinc.

DEVELOPMENT POSSIBILITIES. See DR183.

MINING HISTORY. Unknown.

REMAINING DEPOSIT/ORE. No ore known.

TAILINGS AND DUMP. No tails; dump negligible.

REMAINING EQUIPMENT. None.

MINE HAZARDS. None.

DR183

Unnamed prospect (fig. 19 and mine map: fig. 24)

SUMMARY. Skarn. Short adit.

PRODUCTION AND STATUS. Inactive, no production.

SIZE AND ORIENTATION OF THE DEPOSIT. See sample description.

MINERALOGY, GRADE. 2.0% zinc.

DEVELOPMENT POSSIBILITIES. Possible exploration target for a sphalerite skarn like the San Juan Mine. This, when considered in conjunction with the other small skarn prospects in the vicinity: DR176, 179, 181, 183, is an area where geophysical surveying and possibly drilling could find a concealed zinc deposit of the size and tenor as the San Juan Mine. Commodity prices in 1993 ($0.48/lb zinc, $3.50 oz Ag) are low, and the projected possible deposit size that could be found by exploration is small (abut 15,000 st). Together, these conditions suggest that a deposit, if found, would be difficult to mine at a profit.

MINING HISTORY. Unknown.

REMAINING DEPOSIT/ORE. No ore known.

TAILINGS AND DUMP. No tails; dump about 80 st (at 20 ft^3/st).

REMAINING EQUIPMENT. None.

MINE HAZARDS. None.

DR186

Unnamed prospect (fig. 19, and mine map: fig. 21)

SUMMARY. Weak skarn in Precambrian igneous rock. Prospect adit.

PRODUCTION AND STATUS. Inactive, no production.

SIZE AND ORIENTATION OF THE DEPOSIT. See sample description.

MINERALOGY, GRADE. Low zinc content.

DEVELOPMENT POSSIBILITIES. None.

MINING HISTORY. Unknown.

REMAINING DEPOSIT/ORE. No ore known.

TAILINGS AND DUMP. No tails; dump about 500 st (at 20 ft^3/st).

REMAINING EQUIPMENT. None.

MINE HAZARDS. None.

DR189-190

Unnamed prospect (fig. 19)

SUMMARY. Peripheral exploration around San Juan Mine. Skarn through limestone at shaft collar. Shaft 20-ft-deep.

PRODUCTION AND STATUS. Inactive, probably no production.

SIZE AND ORIENTATION OF THE DEPOSIT. See sample description.

MINERALOGY, GRADE. Reported ZnS 16% (Voelzel, 1942, fig. 3). Bureau assay 0.16% Zn (DR189).

DEVELOPMENT POSSIBILITIES. See San Juan Mine.

MINING HISTORY. Opened prior to 1942.

REMAINING DEPOSIT/ORE. No ore known.

TAILINGS AND DUMP. No tails; dump removed, graded into exploration road.

REMAINING EQUIPMENT. None.

MINE HAZARDS. Minor. Shaft is open, unfenced, but oriented in a way that it would be difficult to fall into.

DR191

Unnamed prospect (fig. 19)

SUMMARY. Peripheral exploration around San Juan Mine. Pit exposes skarn.

PRODUCTION AND STATUS. Inactive, no production.

SIZE AND ORIENTATION OF THE DEPOSIT. See sample description.

MINERALOGY, GRADE. Up to 1% Zn.

DEVELOPMENT POSSIBILITIES. See San Juan Mine, DR195-201, 205-217.

MINING HISTORY. Opened prior to 1942.

REMAINING DEPOSIT/ORE. No ore known.

TAILINGS AND DUMP. No tails; dump 2 st (at 17 ft^3/st).

REMAINING EQUIPMENT. None.

MINE HAZARDS. None.

DR192-193

Cave adit (fig. 19)

SUMMARY. Peripheral exploration around San Juan Mine. Part of eastern extent of San Juan skarn.

PRODUCTION AND STATUS. Inactive, no production.

SIZE AND ORIENTATION OF THE DEPOSIT. See sample description. See DR193.

MINERALOGY, GRADE. 0.47% Zn.

DEVELOPMENT POSSIBILITIES. See San Juan Mine, DR195-201, 205-217. This eastern extent of the San Juan skarn does not have high enough zinc concentrations for development.

MINING HISTORY. Opened prior to 1942.

REMAINING DEPOSIT/ORE. No ore known.

TAILINGS AND DUMP. No tails; dump negligible.

REMAINING EQUIPMENT. None.

MINE HAZARDS. None.

DR194

Copper adit (fig. 19)

SUMMARY. Peripheral exploration around San Juan Mine. Part of eastern extent of San Juan skarn.

PRODUCTION AND STATUS. Inactive, no production.

SIZE AND ORIENTATION OF THE DEPOSIT. See sample description.

MINERALOGY, GRADE. 0.31% Zn.

DEVELOPMENT POSSIBILITIES. See San Juan Mine, DR195-201, 205-217. This eastern extent of the San Juan skarn does not have high enough zinc concentrations for development.

MINING HISTORY. Opened prior to 1942.

REMAINING DEPOSIT/ORE. No ore known.

TAILINGS AND DUMP. No tails; dump negligible.

REMAINING EQUIPMENT. None.

MINE HAZARDS. None.

DR195-201, 205-217

San Juan Mine, comprised of the Sulphide adit, Silver adit, and Mann adit; a.k.a. Gordon Mine (see fig. 19, and mine map: fig. 20)

SUMMARY. Skarn formed along possibly deep, vertical fracture zone was mined for rich sphalerite, some silver. Mined out within confines of the mine workings. Industry exploration (1990 to 1992) up dip shows low grades; exploration down dip does not verify minable tonnages. Skarn to the east has low zinc concentrations.

PRODUCTION AND STATUS. Mine inactive. Active mining claims include mine site. Production:

	Year	st	Contained Zn
	1913	69	Withheld
	1914	?	Withheld
	1915	78	Withheld
	1925(or '24)	46 (or 48)	Withheld
	1947	4,000	Withheld
	1948	2,584	No data
	1949	5,500	No data
	1951	2,195	No data
	1952	361	No data
	1964	154	No data
	1968	181	No data
Totals		15,167	about 2.94 millon lb (extrapolated)

Source: USBM-IFOC files, unpub.

SIZE AND ORIENTATION OF THE DEPOSIT. See sample description.

MINERALOGY, GRADE. Estimated 9.7% Zn, 1% Pb. Silver about 1.3 oz/st, but up to 8.5 oz/st. Sphalerite and galena. Some smithsonite. Silver form unknown. Silver distributed erratically.

DEVELOPMENT POSSIBILITIES/PROBLEMS. An exploration target for an undiscovered deposit could be directly below this mine on the high-angle, near-vertical fractures. These fractures have decreasing dip at depth, and may be over 1,000 ft long down the dip slope. Up-dip exploration and down dip exploration (runs risk of erosion of deposit) has found possible extensions of this same skarn zone, but data on either grades, or tonnages, or deposit dimensions are lacking. This deposit is small. Low tonnage deposits are difficult to mine profitably. Any newly discovered deposit in this skarn zone may be negatively impacted by capital costs. Zinc prices are low. Lead content is too low for recovery, but possibly high enough for smelter penalties.

MINING HISTORY. Jonathan Gordon apparently was the initial and long-time owner of the mine (USBM-IFOC files, unpub.). The mine is thus sometimes referred to as the Gordon Mine. Most references are to the San Juan, after the name of one of the mining claims staked on the property. By April, 1913, 204 ft of the Sulphide adit had been driven, with 68 ft of crosscut, and a 28.5-ft-deep winze. It was not reported when these excavations were begun. The property was for sale at the time for $60,000, and equipment included track, a blacksmith outfit and tents (Miller, 1913, p. 1). No change in ownership is known to have resulted from this advertising. Ores were produced in 1913-1915, and the low tonnage and high grades indicate only very rich zones of sphalerite were taken. Ore shipments were sent out during those years (Wilson, 1951, p. 20). The reason for a hiatus in mining from 1915 to 1924 (or 1925) is not known. More ore was shipped in 1925 (Wilson, 1951, p. 20).

Eagle-Picher did drilling (churn or diamond?) in 1926 and did "considerable" underground excavation, including the Mistletoe adit (fig. 23) (Voelzel, 1942, p. 11; ADMMR files, 1951). That firm also built Gordon Camp (Voelzel, 1942, p. 8), then abandoned the site. A few years later, surface drilling was undertaken by American Metal Co., and that firm also declined to mine at the site (ADMMR files, 1951). USBM examination in 1942 found 21 cuts and adits with aggregate length of 1,650 ft, and 14 shafts with aggregate depth of 260 ft. It appears from the mapping at that time that all excavations except the Mann adit were completed (Voelzel, 1942, p. 8, fig. 3). A wartime loan for the development of wartime crucial metals was denied to the property owners (USBM-IFOC files, unpub.).

In 1947, the Mann brothers, attorneys from Dallas, TX, formed Operations, Inc., acquired the property, and at "great expense" built the road that today provides access to the property. Also, they built a 150 tpd flotation mill in Tombstone, AZ. The company filed for bankruptcy, reasons unknown (ADMMR files, 1951). Little is known of the Mann's mining operations; it is assumed they started the Mann adit. By the end of 1947 their operation was suspended. The Billingsley Machinery Co. purchased the mill in Tombstone, AZ, and re-opened the mine in September 1948. W. M. Shaw, superintendent, reported production of 15,000 st of ores from the Mann adit from late 1948 to early 1949 (Wilson, 1951, p. 20, 23), a production considerably higher than that recorded in other sources. A drop in zinc price forced mine closure in May 1949; Mr. Gordon resumed mining in June 1951 and the mill was sold to Lomelino Mineral Development Co. (Wilson, 1951, p. 21). By October 1951, Lomelino had leased the mine from Gordon and was mining at 50 stpd from old stopes, and milling the ores at their Tombstone mill; lack of profits caused relinquishment of the lease by November 1951. In 1952, Gordon was mining 2.5 stpd and shipping the ore to the American Smelting and Refining mill in Deming, NM.; by August 1952, the drop in zinc price caused shutdown. A price of $0.17/lb zinc was sought for profitability (ADMMR files, 1951, 1952). Data on the mine production of 1964 and 1968 is lacking.

General Minerals of America, Inc., Newport Beach, CA was active at the San Juan Mine in 1980 and 1981, drilling two holes at the original mine site (air-track). Their plan apparently was to mine in or around the main, existing, workings (USDA Forest Service files, Douglas, AZ, 1980, 1985). Results of their work are not known. Toltec Resources, Ltd., in conjunction with West Pride Industries, Inc., two Vancouver firms, started evaluation of the area about 1990 (Robt. C. Smith, USBM, written commun., 1991) and completed four core holes to test the up-dip and down-dip potential of the San Juan skarn between the mine and China Peak (Mining Record, 1992, p. 1).

Howard Birchfield was interested in the site in 1980. What mining claims he may have owned at the time was not determined.

REMAINING DEPOSIT/ORE. Peripheral sphalerite on stopes not quantified. Zones are thin and danger of surface collapse due to mine subsidence is considerable.

TAILINGS AND DUMP. No tails visible, though material around old mill site probably used in exploration road grade construction. Dumps very small: about 700 st at the Sulphide adit, 500 st at the Silver adit; 80 st by an inclined raise to the surface at the western part of the Silver adit; 70 st at the Mann adit. All dumps calculated with a tonnage factor of 20 ft^3/st.

REMAINING EQUIPMENT. A little rail.

MINE HAZARDS. Biggest problem is subsidence through to the surface due to caving of stoped areas in the Sulphide adit stope. One hole broke through to the surface prior to 1967 (see map). It is not much of a hazard to fall into due to its location. Collapse of the road immediately to the east of the subsidence hole is a possibility, but the road has already been closed by a Forest Service plastic stake well below the San Juan Mine workings. Other nearby stopes on that level could collapse as well (see map). Open, flooded winze near the Sulphide adit portal is a falling, drowning hazard to the acutely unaware. Bad portal conditions at the Silver adit; also shallow winze near the portal. However, most of the large, loose blocks of rock at the portal have already fallen. The Mann adit has collapsed badly. It would be a hazard for rock-fall injury only if someone tries to attempt an obviously very difficult and risky entry of the adit.

DR202

Burro adit (fig. 19)

SUMMARY. Peripheral exploration around San Juan Mine. Part of eastern extent of San Juan skarn.

PRODUCTION AND STATUS. Inactive, no production.

SIZE AND ORIENTATION OF THE DEPOSIT. See sample description.

MINERALOGY, GRADE. 2.8% Zn.

DEVELOPMENT POSSIBILITIES. See San Juan Mine. This eastern extent of the San Juan skarn does not have high enough zinc concentrations for development. This sample was the best of the group.

MINING HISTORY. Opened prior to 1942.

REMAINING DEPOSIT/ORE. No ore known.

TAILINGS AND DUMP. No tails; dump negligible.

REMAINING EQUIPMENT. None.

MINE HAZARDS. None.

DR203

Unnamed prospect adit of the San Juan Mine (fig. 19)

SUMMARY. Peripheral exploration around San Juan Mine. Part of southern extent of San Juan skarn.

PRODUCTION AND STATUS. Inactive, no production.

SIZE AND ORIENTATION OF THE DEPOSIT. See sample description.

MINERALOGY, GRADE. 1.2% Zn.

DEVELOPMENT POSSIBILITIES. See San Juan Mine. This southern extent of the San Juan skarn does not have high enough zinc concentrations for development. This sample was the best of the group.

MINING HISTORY. Opened prior to 1942.

REMAINING DEPOSIT/ORE. No ore known.

TAILINGS AND DUMP. No tails; dump negligible.

REMAINING EQUIPMENT. None.

MINE HAZARDS. None.

DR204

Prospect adit of the San Juan Mine, probably the "Disseminated adit" of Voelzel (1942, fig. 3) (see fig. 19 in Coronado report).

SUMMARY. Peripheral exploration around San Juan Mine. Part of southern extent of San Juan skarn.

PRODUCTION AND STATUS. Inactive, no production.

SIZE AND ORIENTATION OF THE DEPOSIT. See sample description.

MINERALOGY, GRADE. 0.26% Zn.

DEVELOPMENT POSSIBILITIES. See San Juan Mine. This southern extent of the San Juan skarn does not have high enough zinc concentrations for development.

MINING HISTORY. Opened prior to 1942.

REMAINING DEPOSIT/ORE. No ore known.

TAILINGS AND DUMP. No tails; dump negligible.

REMAINING EQUIPMENT. None.

MINE HAZARDS. None.

DR218-219

Blende adit, prospect of the San Juan Mine group (fig. 19, and mine map: fig. 22)

SUMMARY. Peripheral exploration around San Juan Mine. Part of southern extent of San Juan skarn.

PRODUCTION AND STATUS. Inactive, no production.

SIZE AND ORIENTATION OF THE DEPOSIT. See sample description.

MINERALOGY, GRADE. 0.57% Zn.

DEVELOPMENT POSSIBILITIES. See San Juan Mine. This southern extent of the San Juan skarn does not have high enough zinc concentrations for development. Site is a demonstration of the erosion problems to be encountered if following the San Juan skarn down dip.

MINING HISTORY. Opened prior to 1942.

REMAINING DEPOSIT/ORE. No ore known.

TAILINGS AND DUMP. No tails; dump incorporated into exploration road grade.

REMAINING EQUIPMENT. None.

MINE HAZARDS. None.

DR221-222

Mistletoe adit, prospect of the San Juan Mine group (fig. 19 and mine map: fig. 23)

SUMMARY. Peripheral exploration around San Juan Mine. Part of southern extent of San Juan skarn.

PRODUCTION AND STATUS. Inactive, no production.

SIZE AND ORIENTATION OF THE DEPOSIT. See sample description.

MINERALOGY, GRADE. 0.94% Zn.

DEVELOPMENT POSSIBILITIES. See San Juan Mine. This southern extent of the San Juan skarn does not have high enough zinc concentrations for development.

MINING HISTORY. Opened about 1926 by Eagle-Picher.

REMAINING DEPOSIT/ORE. No ore.

TAILINGS AND DUMP. No tails; dump largely washed into gully to southeast.

REMAINING EQUIPMENT. None. Was at one time dammed inside to make a water reservoir. It holds no water now (summer, 1992).

MINE HAZARDS. Bad condition of the ribs and back of the short exploratory drift trending southwest off the main drift, near the portal suggest this side drift should be fenced off. The intersection of this drift and the main drift is wide, and the rocks there are fractured into large, high-tonnage blocks that could fall.

DR223-224

Unnamed adit, prospect of the San Juan Mine group (fig. 19)

SUMMARY. Peripheral exploration around San Juan Mine. Part of southern extent of San Juan skarn.

PRODUCTION AND STATUS. Inactive, no production.

SIZE AND ORIENTATION OF THE DEPOSIT. See sample description.

MINERALOGY, GRADE. Up to 0.38% Zn.

DEVELOPMENT POSSIBILITIES. See San Juan Mine. This southern extent of the San Juan skarn does not have high enough zinc concentrations for development.

MINING HISTORY. Opened prior to 1942.

REMAINING DEPOSIT/ORE. No ore.

TAILINGS AND DUMP. No tails; dump negligible in size.

REMAINING EQUIPMENT. None.

MINE HAZARDS. None.

DR225

Prospect shaft, part of the San Juan Mine group (fig. 19)

SUMMARY. Peripheral exploration around San Juan Mine. Part of southern extent of San Juan skarn.

PRODUCTION AND STATUS. Inactive, no production.

SIZE AND ORIENTATION OF THE DEPOSIT. See sample description.

MINERALOGY, GRADE. 1.3% Zn.

DEVELOPMENT POSSIBILITIES. See San Juan Mine. This southern extent of the San Juan skarn does not have high enough zinc concentrations for development. This was the highest grade sample from the group.

MINING HISTORY. Opened prior to 1942.

REMAINING DEPOSIT/ORE. No ore.

TAILINGS AND DUMP. No tails; dump about 20 st.

REMAINING EQUIPMENT. None.

MINE HAZARDS. None.

DR226-239

Muheim Mine (DR236-239, fig. 19; see mine map, fig. 26), and small prospect adit to the west (DR234-235, fig. 19, no detailed mine map); lower prospect adit (DR227-233, fig. 19; see mine map, fig. 27) that attempted to crosscut the Muheim skarn; southwestern open cut prospect (DR226, fig. 19, no detailed mine map). Muheim Mine also known as White Tail, after the name of one of the original mining claims on which the main working was excavated. Other names used were "Zinc Basin" (the name of the topographic feature in which mine was excavated), and "White Metal" (Keith, 1973, p. 69), after weathering products of zinc.

SUMMARY. Zinc-bearing skarn, probably an eastern extension of the San Juan skarn. However, the skarn has been eroded between the San Juan Mine hill and the Muheim Mine hill.

PRODUCTION AND STATUS. Inactive, production was 83 st in 1924, 60 st in 1928, and 74 st in 1929, all from the DR236-239 working.

SIZE AND ORIENTATION OF THE DEPOSIT. The skarn was not mined out. Inferred tonnage of 37,000 st between the sites DR236-239, DR234-235 (down dip and to the west), and the skarn zone exposed in DR227-233 (down dip). Strike is N. 35° W., and dip is SW. 64°, though strike (and probably dip) varies. Strike-slip faulting is extensive and likely causes numerous pinch-outs of the skarn between the three localities cited.

MINERALOGY, GRADE. Skarn minerals with sphalerite, galena, and silver (form not known). Grades reported were 4.38% Zn, 4.83% Pb, and 4.91 oz Ag/st (Mining Record, 1992, p. 1). Other minerals identified were smithsonite (Miller, 1913, p. 1), a zinc secondary mineral, and possibly hemimorphite [$Zn_4Si_2O_7(OH) \cdot H_2O$] and anglesite ($PbSO_4$) (Cederstrom, 1946a, p. 89), weathering products of zinc and lead, respectively.

DEVELOPMENT POSSIBILITIES/PROBLEMS. Unlikely due to low zinc grades and low zinc prices in 1992. PREVAL modeling suggests losses of over $40/st ore mined would occur with no recovery of capital expenditures.

MINING HISTORY. Mostly unknown. All activity apparently ended before 1930.

REMAINING DEPOSIT/ORE. No ore. Deposit size is speculative (see above) and requires drilling down dip and along strike to define resources.

TAILINGS AND DUMP. No tails. Dumps are small: the long prospect drift has about 600 st dump (DR232-233); open cut prospect (DR226) has 30 st; prospect adit DR235 is about 400 st; Muheim Mine adit, the main productive part of the mine (DR239), is about 400 st; Muheim Mine open cut (DR237-238) is about 200 st. Limestone-rich dumps calculated at 20 ft^3/st and skarn-rich dumps calculated at 17 ft^3/st.

REMAINING EQUIPMENT. Rail throughout the lower prospect adit (the largest working of the group (DR227-233). On the dump (DR232-233) is the body and chassis of a late model Chevrolet Suburban; it is scrap, having been rolled and damaged extensively.

MINE HAZARDS. The back and ribs in the prospect adit DR234-235 are in poor condition; much loose rock that could fall. It is not safe to enter. Fencing off the portal would be wise. On the positive side, this site is in an obscure location and is difficult to reach due to terrain and brush conditions. The open shaft to the surface from the main Muheim Mine adits (DR236-239; see mine map, fig. 26) is a falling hazard. Falling that depth probably would not be fatal, but would cause broken bones. The subsidence cave-in immediately to the west is a minor falling hazard.

DR240-243

Lulty(?) prospect (fig. 19)

SUMMARY. Three skarn zones (DR240; DR242; DR241 & 243) through marble that could be eastern extension of the Muheim skarn. Continuity was not determined, mainly due to talus and soil cover west of the site. Some of the skarn (DR241) is within 25 ft of a granitic dike.

PRODUCTION AND STATUS. Inactive, no production.

SIZE AND ORIENTATION OF THE DEPOSIT. See sample notes. The skarn traced farthest on strike, 150-ft-long, is covered on the west end and buried on the east end.

MINERALOGY, GRADE. Wollastonite skarn forms footwall to DR242 skarn. Samples mostly black-brown or green-brown calc-silicates. Zinc in DR243 was 1.6%; other samples had >1% Zn. No lead over 0.11%; maximum copper 0.78%. Silver content low in all samples.

DEVELOPMENT POSSIBILITIES/PROBLEMS. Development in the immediate area unlikely due to low zinc grades. Exploration by ground magnetometer and E.M. surveying between this site and the Muheim Mine may discover concealed zinc mineralization in skarn. The low price of zinc in 1993 and the deposit modeling attempted for the Muheim deposit suggest that making a return on such an exploration investment would be difficult.

MINING HISTORY. Mostly unknown. The DR242 or DR243 site was apparently started as a shaft prior to 1952 (Anaconda Geol. Document Collection, document 8019, 1952). at some unknown time after that, bulldozer excavations were made at DR242-243 (obliterating the shaft), and at DR241. Also, the DR240 adit was excavated.

REMAINING DEPOSIT/ORE. No ore. See "Development possibilities".

TAILINGS AND DUMP. No tails. Dump at DR240 is small: 10 st. Bulldozer excavation debris is mostly dispersed in the gully bottom.

REMAINING EQUIPMENT. None.

MINE HAZARDS. None.

DR244

Sorin Camp Mine (un-sampled, see pl. 1) and nearby prospect adit to the east (DR244, see mine map, fig. 25). A small prospect pit is 300 ft east of DR244 adit (see pl. 1).

SUMMARY. Almost no data. Mine referred to in Russell and Assoc. (1967, p. 4) as copper mine opened as part of Middlemarch Canyon work.

PRODUCTION AND STATUS. Sorin Camp Mine completely caved; all geology around what appears to have been the portal area is obscured completely by rock fall, slump of the hillside, talus, and soil. Production likely, but unknown.

SIZE AND ORIENTATION OF THE DEPOSIT. Completely unknown. The small prospect adit (DR244) does not intersect the mineralization of the mine. It may have been an attempted crosscut to get around the caved Sorin Camp Mine portal. If so, prospect adit DR244 was not driven far enough. The small prospect pit 300 ft east of DR244 is 8 ft by 8 ft and is now 6-ft-deep. Probably 10-ft-deep when originally excavated. It is filled with debris and trash. Exposes chloritized granite with a thin (1-ft-thick) fracture in granite (N. 30° W., SW. 85°) contains epidote on thin (1/4-in.-thick) fracture planes. This fracture plane covered by talus above the pit and by alluvium below the pit.

MINERALOGY, GRADE. Unknown. DR244 adit cuts quartzite and exposes minor epidotization along joint planes (see map, fig. 25). Assay low in base and precious metals concentrations.

DEVELOPMENT POSSIBILITIES/PROBLEMS. Unknown with lack of data.

MINING HISTORY. Unknown. Bob Barber held the mining claim that included the mine about 1967 (Russell and Assoc., 1967). The mine is probably as old as the Cobre Loma Mine (early 1900's to 1920's).

REMAINING DEPOSIT/ORE. Unknown.

TAILINGS AND DUMP. No tails. Dumps at DR244 removed for road grade of Sorin Gulch road (a.k.a. Sorin Canyon). No dump at Sorin Camp Mine portal area. Possibly, all material was removed and used in road grade or windmill foundation in Sorin Gulch. Dump at pit 300 ft east of DR244 is of negligible size.

REMAINING EQUIPMENT. None visible.

MINE HAZARDS. None.

DR246-250

Cobre Loma Mine (see fig. 14, and mine map: fig. 16)

SUMMARY. Adit with approximately 750 ft of drifting on one level. Stoping where late Tertiary(?) (post-Stronghold batholith) intrusive dike formed skarn in Bisbee Group carbonates.

PRODUCTION AND STATUS. Production total uncertain. At least 5,000 st of copper ores produced between 1915 and 1920. Recovered copper from these ores unknown. Stoped areas are caved and inaccessible. Data from old Middlemarch Copper Co. mine map (ADMMR files, unpub. map), and from Innes and Assoc. (1982, p. 2).

SIZE AND ORIENTATION OF THE DEPOSIT. NW.-trending, steeply SW.-dipping skarn in two sections, totalling about 130 ft of strike length. Faulting along intrusive-carbonate contact.

MINERALOGY, GRADE. Chalcopyrite and sphalerite in skarn; "black iron" and fluorspar common (Innes and Assoc., 1982, p. 18 citation of Edward Kelley's 1913 mine report). Grades of 7% Cu in previously cited report could not be verified. Mahoney (1942a, p. 4) sampled stockpiled, siliceous, hematite enriched rock by portal (since removed): 1.67% Cu, 0.1% Zn.

DEVELOPMENT PROBLEMS AND POSSIBILITIES. An extension of the deposit along the same fracture zone to the NW. (towards Cochise Peak) is possible. At the mine: narrow deposit width and weak shale wall rock on one side suggest this structure could not be mined at a profit in 1993. Caving prevents complete access; unknown if resources remain in mine.

MINING HISTORY. Unknown. Likely opened in 1900 to 1915 era..

REMAINING DEPOSIT/ORE. Probably none in the mine.

TAILINGS AND DUMP. No tailings. Dump is barren rock, mostly shale, estimated to be 800 st.

REMAINING EQUIPMENT. None.

MINE HAZARDS. Caving at portal (shale) has obstructed portal opening. Problem could worsen in wet weather. A minor hazard. Could be eliminated for a time by fencing off portal (caving would eventually recede away from fencing, making portal "accessible" again).

DR251

Lloyd and Laverns prospect (fig. 14)

SUMMARY. Skarn in limestone. Exposed in a trench that trends N. 35° E. for 25 ft, with 12-ft-long adit on same bearing at NE end.

PRODUCTION AND STATUS. Likely no production. Not an active prospect site.

SIZE AND ORIENTATION OF THE DEPOSIT. Skarn trends N. 60° W., dips NE. 31°, through limestone breccia. Skarn exposed for 81 ft on strike: 25 ft to NW. of trench (lost in soil cover); about 50 ft to SE. of trench (spotty exposure) (lost in talus and soil); exposed for 6 ft *in* trench. Width of skarn is 20.5 ft.

MINERALOGY, GRADE. Green/brown calc-silicates, moderate limonitic stain, weathered pyrite, carbonate-enriched. Zinc enriched (> 1%), copper poor (25 ppm), and moderate silver content (about 2.5 oz/st).

DEVELOPMENT PROBLEMS AND POSSIBILITIES. Mining by drifting along strike from the existing mine road to Cobre Loma Mine would be the most economical approach. Not enough contained metal value in zinc and silver can be shown to make this property a possible exploration target.

MINING HISTORY. Unknown. Likely opened in 1900 to 1915 era.

REMAINING DEPOSIT/ORE. Skarn stockpiled (less than 50 st). The in-place skarn structure is covered at the northern end of exposure, but does not appear to be pinching out. If modeled as a tabular structure, continuous along strike for 200 ft (about twice the exposed strike length), 20.5 ft wide, and extending down the dip slope for 40 ft (half the exposed length), it contains 13,000 st of rock. Tonnage factor applied: 13 ft^3/st.

TAILINGS AND DUMP. No tailings. Dump is negligible in size, not enriched.

REMAINING EQUIPMENT. None.

MINE HAZARDS. None.

DR252-253

"Bill's cut" prospect (fig. 14)

SUMMARY. On Cobre Loma mineralization trend. A 60-ft-long bulldozer cut on NW. side of gully along two skarn zones that are adjacent to Tertiary granitic rock and within 50 ft of quartz-monzonite porphyry. Skarn previously exposed by erosion.

PRODUCTION AND STATUS. Likely no production. Not an active prospect site.

SIZE AND ORIENTATION OF THE DEPOSIT. Can't trace DR252 skarn on strike (soil and talus cover). DR253 skarn, a natural exposure beyond trench, is covered by talus. Skarn in NW.-trending fault zone (Drewes and Meyer, 1983, map).

MINERALOGY, GRADE. DR252 skarn: brown calc-silicates, major actinolite, moderate limonitic stain, minor malachite stain. DR253 skarn: dark green calc-silicates, with laminations of epidotized limestone. No copper over 0.21%; no zinc over 0.08%; negligible silver.

DEVELOPMENT PROBLEMS AND POSSIBILITIES. No development possibilities at this site, due to low grades. Site demonstrates continuity of Cobre Loma mineralization trend.

MINING HISTORY. A recent excavation, probably done sometime between 1975 and 1981.

REMAINING DEPOSIT/ORE. None known.

TAILINGS AND DUMP. No tailings or dump.

REMAINING EQUIPMENT. None.

MINE HAZARDS. None.

DR254-255

"McDaniel's cut" prospect (fig. 14)

SUMMARY. On Cobre Loma mineralization trend. DR254: an open cut in gully bottom, trends N. 40° W. for 25 ft, to an undercut, 16-ft-long, perpendicular face to the NE. with a 23 ft highwall. Exposes skarn, 20-ft-thick. DR255: prospect adit in Bisbee Group black shale, less than 100 ft SE. of McDaniel's Cut; was 87 ft long, but outer 35 ft of adit collapsed, leaving trench-like excavation; adit, S. 45° W., intersects fault contact with shale, limestone, 77 ft in from original portal. Fault: N. 76° W., dips SW. 82°. A splay of fault zone controlling *Cobre Loma mineralization trend.*

PRODUCTION AND STATUS. Likely no production. Not an active prospect site.

SIZE AND ORIENTATION OF THE DEPOSIT. DR254: can't trace due to soil cover to NW., and vegetation, road fill to SE. The 20-ft-thick skarn trend is N. 40° W., dips SW. 68°. DR255: fault exposed only in adit; a splay of fault zone controlling *Cobre Loma mineralization trend.*

MINERALOGY, GRADE. DR254: green-brown calc-silicates. No copper over 0.1%; no zinc over 0.28%; negligible silver. DR255: black shale, with minor clay, jarosite, slickensides, and moderate limonitic stain. Has 0.7% zinc.

DEVELOPMENT PROBLEMS AND POSSIBILITIES. No development possibilities at these sites, due to low grades. Site demonstrates continuity of Cobre Loma mineralization trend.

MINING HISTORY. A recent excavation, probably done sometime between 1975 and 1981.

REMAINING DEPOSIT/ORE. None known.

TAILINGS AND DUMP. No tailings. Dump DR254 is all used as road bed. Dump DR255 fills gully; not mineralized; small size, but not measured.

REMAINING EQUIPMENT. None.

MINE HAZARDS. DR254: the 16 ft-long, 23-ft-high, undercut highwall. It is next to an old prospect road, so is accessible to hikers and some of the better off-road vehicles. Danger is rock-fall from highwall. Fencing it or blasting down overhang would eliminate danger. A moderate hazard. DR 255: dangerous, unstable portal area has been fenced.

DR256-258

Ella prospect, a.k.a. "Loma Linda Mine"(?) (fig. 14)

SUMMARY. DR256: an inclined shaft on skarn (SW. 42°) that trends S. 60° W. for 28 ft to a vertical shaft into the skarn. Vertical shaft 6 ft X 6 ft. The workings reached a depth of 187 ft by 1913 and encountered a "large", "low-grade" deposit (Innes and Assoc., 1982, p. 16), presumably with copper and zinc concentrations. A level drift was observed 15 ft down from inclined shaft collar; it is 13 ft wide, trends about S. 45° E. for unknown length. DR258: pit, 7 ft X 15 ft, 10-ft-deep on skarn that parallels and is 45 ft to 50 ft stratigraphically above the skarn exposed in the Ella shaft (DR256-257).

PRODUCTION AND STATUS. No production. Not an active prospect site.

SIZE AND ORIENTATION OF THE DEPOSIT. DR256-257: the 5.3-ft-thick skarn trends N. 50° W. Can't trace on forested hillside. Extends to site DR258: N. 60° W., dips SW. 50°.

MINERALOGY, GRADE. DR256-257: epidotized porphyry. Exceeds 1% Cu, 0.3% Zn. DR258: exceeds 1% Cu, 0.25% Zn.

DEVELOPMENT PROBLEMS AND POSSIBILITIES. *Extension of Cobre Loma mineralization trend.* Deposit at 187 ft of depth may be comparable in grade to Cobre Loma's mined zones. No crosscut adit was ever driven into the zone. The skarn zone at the collar is too narrow for mining. Costs to mine and produce would exceed several hundred dollars per st of ore mined, which is more than the contained metal value of the rock. Greater thicknesses must be proven at depth in order for further economic consideration. Geophysical surveys and drilling would be in order to delineate minable width, tonnage at depth. An exploration budget of approximately $35,000 to $50,000[1] would be needed to determine this.

MINING HISTORY. Little is known; shaft sunk around 1913 (Innes and Assoc., 1982, p. 16).

REMAINING DEPOSIT/ORE. Exploration of the shaft is required to assess.

TAILINGS AND DUMP. No tailings. Much of DR257 dump is dispersed down hill to NE into tree cover. Only consolidated dump area is 40 st (based on 17 ft^3/st). DR258: Dump is small, 10 st (based on 17 ft^3/st).

REMAINING EQUIPMENT. None.

MINE HAZARDS. DR256: ***site (collar of inclined shaft) is a hazard and should be fenced.*** Persons entering, if they slipped, would readily slide into and down the vertical shaft.

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[1] Based on $0.33/ft for I. P. survey; $0.036/ft for ground magnetometer survey; $0.276/ft for exploration drill road extension; $19.44/ft for drilling (Western Mine Engineering, Inc., 1987-1992).

DR259

Unnamed prospect (fig. 14)

SUMMARY. Bulldozer cut on hillside, less than 20 years old, exposes skarn that is *continuation of Cobre Loma mineralization trend.*

PRODUCTION AND STATUS. No production. Not an active prospect site.

SIZE AND ORIENTATION OF THE DEPOSIT. 20-ft-thick skarn exposed on strike for 200 ft to north on trend of N. 10° W., with irregular dip. Covered to south by talus.

MINERALOGY, GRADE. Calc-silicate minerals. Low copper, zinc, silver concentrations.

DEVELOPMENT PROBLEMS AND POSSIBILITIES. *In Cobre Loma mineralization zone (orientation changes from N. 40° W.).* Parallels skarn DR256-258.

MINING HISTORY. Unknown; probably a recent excavation.

REMAINING DEPOSIT/ORE. No ore.

TAILINGS AND DUMP. No tailings or dump.

REMAINING EQUIPMENT. None.

MINE HAZARDS. None.

DR260-261

Silver Hill prospect (fig. 14)

SUMMARY. A 30-ft-long trench cut perpendicular to skarn; sloughed to 4 ft deep and was <10-ft-deep when new.

PRODUCTION AND STATUS. No production. Not an active prospect site.

SIZE AND ORIENTATION OF THE DEPOSIT. Skarn continuous on strike to NW. for 150 ft, but has thinned (10 ft to 15 ft) within 50 ft of DR260, and dissipates as stringers at NW. end in rhyolite porphyry and intermediate-composition porphyry; to the SE. skarn is lost in stream alluvium DR261). Total strike length is 270 ft.

MINERALOGY, GRADE, AND DENSITY. Silica rich and carbonate poor. Low copper, zinc, silver concentrations.

DEVELOPMENT PROBLEMS AND POSSIBILITIES. Grades are low. *Not an extension of Cobre Loma mineralization trend, but a parallel one of similar mineralogy.*

MINING HISTORY. Unknown; probably a recent excavation (1970's or early 1980's).

REMAINING DEPOSIT/ORE. No ore.

TAILINGS AND DUMP. No tailings or dump (dump dispersed by stream).

REMAINING EQUIPMENT. None.

MINE HAZARDS. None.

DR262

Unnamed prospect (fig. 14)

SUMMARY. Prospect pit, flooded, 18 ft X 30 ft, 12-ft-deep to water; total depth unknown. No geology exposed; rim covered by mud, dump, colluvium. Sample: representative of all material on skarn stockpile from this pit.

PRODUCTION AND STATUS. Production possibly all stockpiled (400 st, at 17 ft^3/st). Not an active prospect site.

SIZE AND ORIENTATION OF THE DEPOSIT. No geology exposed. Encountered skarn.

MINERALOGY, GRADE. Skarn of same mineralogy as Middlemarch Mine. Zinc $>1\%$.

DEVELOPMENT PROBLEMS AND POSSIBILITIES. As part of the DR263-264 site.

MINING HISTORY. A recent excavation (probably 1970's).

REMAINING DEPOSIT/ORE. See discussion of site DR263-264 (the Pit)

TAILINGS AND DUMP. No tailings or dump.

REMAINING EQUIPMENT. None.

MINE HAZARDS. None.

DR263-264

"The Pit" of Middlemarch Mine area (fig. 14)

SUMMARY. Open cut, on skarn, flooded, 75 ft X 45 ft, 20 ft deep to water; total depth unknown. Adits driven into skarn from inside open cut (Innes and Assoc., 1982, p. 15), but all are below water line and no maps of them are known.

PRODUCTION AND STATUS. Production possibly all stockpiled (2,000 st at 17 ft^3/st). Not an active prospect site.

SIZE AND ORIENTATION OF THE DEPOSIT. Skarn zone is about 100 ft thick; buried to north and south by conglomerate. Strikes NW., dip near vertical.

MINERALOGY, GRADE. Skarn of same mineralogy as Middlemarch Mine. Zinc >1%. Compare assays to DR263, which is same skarn from a stockpile.

DEVELOPMENT PROBLEMS AND POSSIBILITIES. Could not be mined economically, based on known data; deposit size is too small. A greater thickness must be shown through exploration, and the actual depth and strike length must be determined.

MINING HISTORY. A recent excavation (early-to-mid 1970's).

REMAINING DEPOSIT/ORE. With available data, the deposit is 7,600 st in size. Mining likely would not be profitable on such a low-tonnage site.

TAILINGS AND DUMP. No tailings. Essentially no dump; mining was directly into the high-grade zones in skarn.

REMAINING EQUIPMENT. None.

MINE HAZARDS. Highwall, which is vertical and 20-ft-deep to water. This has been completely fenced.

DR267-268

Unnamed prospect (fig. 14)

SUMMARY. Exploratory open cut, 60 ft X 14 ft, with 30 ft highwall at NE. end, but only 5-ft-deep at SW. end; trends N. 60° E. to explore for skarn zone of DR262-264. Did not intersect the skarn.

PRODUCTION AND STATUS. Inactive, No production.

SIZE AND ORIENTATION OF THE DEPOSIT. No deposit.

MINERALOGY, GRADE. No skarn formed here. 0.37% Zn and 1.8% Zn in two samples. Low copper and silver.

DEVELOPMENT PROBLEMS AND POSSIBILITIES. None.

MINING HISTORY. A recent excavation (early-to-mid 1970's).

REMAINING DEPOSIT/ORE. None.

TAILINGS AND DUMP. No tailings. Dump is un-mineralized, piled by mouth of cut. Not measured.

REMAINING EQUIPMENT. None.

MINE HAZARDS. The highwall is undercut and represents a rock fall hazard inside the pit, and a falling hazard from the rim of the cut. The highwall has been completely fenced.

DR269

Unnamed shaft (fig. 14)

SUMMARY. Shaft, 7 ft X 5 ft collar, 63-ft-deep.

PRODUCTION AND STATUS. Inactive, production unknown.

SIZE AND ORIENTATION OF THE DEPOSIT. Unknown.

MINERALOGY, GRADE. Probably skarn at depth. Low copper, silver, and zinc.

DEVELOPMENT PROBLEMS AND POSSIBILITIES. None.

MINING HISTORY. Unknown. Probably excavated prior to 1950.

REMAINING DEPOSIT/ORE. Unknown.

TAILINGS AND DUMP. No tailings. Dump contains some skarn. Dump size unknown.

REMAINING EQUIPMENT. None noted.

MINE HAZARDS. Unknown. Depth of shaft suggests falling hazard. Unknown if it has been fenced off.

DR270

Unnamed shaft (fig. 14)

SUMMARY. Shaft, 7 ft X 10 ft collar, 10-ft-deep.

PRODUCTION AND STATUS. Inactive, production unknown, unlikely.

SIZE AND ORIENTATION OF THE DEPOSIT. Not recorded by geologist.

MINERALOGY, GRADE. Probably skarn at depth. Copper (0.13%) and zinc (0.11%) from dump rock. Exposure of granitic rock is likely the late Tertiary-age intrusive that is mineralizing source in Middlemarch Canyon occurrences.

DEVELOPMENT PROBLEMS AND POSSIBILITIES. Probably none.

MINING HISTORY. Unknown. Probably excavated prior to 1950.

REMAINING DEPOSIT/ORE. Unknown.

TAILINGS AND DUMP. No tailings. Dump size unknown.

REMAINING EQUIPMENT. None noted.

MINE HAZARDS. Unknown. Depth of shaft suggests minor falling hazard. Unknown if it has been fenced off.

DR271-274

Unnamed adit (fig. 18)

SUMMARY. Adit, 64-ft-long, possibly in metasomatized pendant of sedimentary rock. Alteration due to intrusive that is probably the late-Tertiary-age mineralizing source in the Middlemarch Canyon occurrences.

PRODUCTION AND STATUS. Inactive, production unknown, unlikely.

SIZE AND ORIENTATION OF THE DEPOSIT. Unknown.

MINERALOGY, GRADE. Uncertain. Possibly skarn-type. High zinc in all four samples (0.37%, 0.5%, and two with >1% Zn.

DEVELOPMENT PROBLEMS AND POSSIBILITIES. Undetermined.

MINING HISTORY. Unknown. Probably excavated prior to 1950.

REMAINING DEPOSIT/ORE. Unknown.

TAILINGS AND DUMP. No tailings. Dump size unknown.

REMAINING EQUIPMENT. None noted.

MINE HAZARDS. Open shaft to surface from near adit face represents a falling hazard of at least 20 ft. Depth of shaft inside adit is unknown. Unknown if it has been fenced off at the surface.

DR275

Emma adit (fig. 14)

SUMMARY. Adit, caved to 2 ft high at portal; 12 ft long?; trends S. 45° E. on joints in limestone cobble breccia (Glance Conglomerate?); 15-ft-long open cut of same bearing adjoins portal; rock at portal is barren.

PRODUCTION AND STATUS. Inactive, production unknown, unlikely.

SIZE AND ORIENTATION OF THE DEPOSIT. Not exposed.

MINERALOGY, GRADE. Calc-silicate minerals. High copper and zinc concentrations; moderate amounts of silver.

DEVELOPMENT PROBLEMS AND POSSIBILITIES. Small size of this caved drift suggests a skarn of very limited tonnage. Especially considering the proximity to Middlemarch Mine; nearby sites would have been fully explored. Probably no development possibilities.

MINING HISTORY. Unknown. Probably excavated prior to 1921.

REMAINING DEPOSIT/ORE. Likely none.

TAILINGS AND DUMP. No tailings. Small dump: 40 st @ 17 ft^3/st.

REMAINING EQUIPMENT. None.

MINE HAZARDS. None.

DR276-277

Mill tailings, Middlemarch Mine (fig. 14)

SUMMARY. Tailings from copper flotation mill (mill removed). No damming was done.

PRODUCTION AND STATUS. Abandoned mill site, but part of current mining claim block. See Middlemarch Mine for production.

SIZE AND ORIENTATION OF THE DEPOSIT. Tailings cover 270 ft X 120 ft area and are thin (5.5 ft deep). This is 9,000 st of tailings at 20 ft^3/st.

MINERALOGY, GRADE, AND DENSITY. Mineralogy not determined. Copper is elevated (0.2%) and zinc ranges from 0.3% to 0.8%. Silver is negligible.

DEVELOPMENT PROBLEMS AND POSSIBILITIES. Could be readily removed from road by front-end loader, but it would not pay to haul these tailings to a custom mill for re-processing in a flotation mill. They could be leached in place for the copper, but the zinc would leach also and make the leachate unusable.

MINING HISTORY. Tailings from 1917 to 1921 milling.

REMAINING DEPOSIT/ORE. All the tonnage could potentially be reprocessed for copper.

TAILINGS AND DUMP. All tailings.

REMAINING EQUIPMENT. None.

MINE HAZARDS. None observed.

DR278-283

Middlemarch Mine (a.k.a. Missouri Mine) including a glory hole known as Missouri Shaft (a.k.a. Morning Glory Shaft) (see fig. 14, and mine map: fig. 15).

SUMMARY. Middlemarch is a sulfide copper mine with byproduct silver, and potential to have high-grade zinc sulfides. Possibly most favorable exploration target in the Dragoon Mountains unit of the National Forest.

The deposit is an inclined, cylindrical skarn zone, postulated to be a breccia pipe, that has been mined for its skarn content of copper, and residual copper, silver and gold. Zinc is reported below the mined sulfide zone in double-digit concentrations. The mined zone measures 40 ft by 60 ft and is exposed at the ground surface, continuing to a total deposit depth of 325 ft.

PRODUCTION AND STATUS. The mine probably has not been worked since 1921, being flooded below the Fourth Level most of the time since. The Fourth Level portal, accessible via a passageway through deteriorated lagging and cribbing as recently as August 1992, is now caved badly, which occurred most likely in January 1993, when uncharacteristically heavy rainstorms overtook the region. New timbering and removal of several tons of rock from the immediate portal area is required for any reasonably expedient, safe access to the mine's main drift.

The property is currently staked with mining claims of Lloyd Richards, Pearce, AZ, and is being explored by two Vancouver firms: West Pride Industries Corp. and Toltec Resources Ltd. They have conducted drilling and coring in Middlemarch Canyon from about 1990 to 1992 (Robt. C. Smith, USBM, 1990, written commun.; Mining Record, 1992, p. 1).

Using published figures on mill-head grade, concentrate recovery, and copper and silver output, it appears that only 9,814 st of copper-bearing ores were taken from the mine, which yielded 265,000 lb copper and 16,600 oz of silver (Mahoney, 1942a, p. 1,2; Elsing and Heineman, 1936, p. 91), calculating with $0.60/oz silver.

SIZE AND ORIENTATION OF THE DEPOSIT. The pipe structure plunges 45° on a N. 85° W. bearing (Mahoney, 1942a, map; Snyder, 1919, p. 181). Four different estimates of the dimensions of this elliptical pipe yield arithmetic average dimensions of 42.5 ft by 61.25 ft (Snyder, 1916, p. 4; Wilson, 1918, p. 1; Cameron, 1974, p. 3; Mahoney, 1942a, p. 1). The pipe extends 325 ft from the surface to a fault contact at depth with aplitic granite (Snyder, 1916, p. 2; Mahoney, 1942a, map). Kirwan's (1975, p. 2) assertion that the deposit extends to 800 ft in depth appears unfounded.

MINERALOGY, GRADE. Density of the mined material, from Snyder's bulk sampling (1916, p. 4) is 13 ft^3/st. Grade of remaining material (Snyder, 1916, p. 4) is 1.74% Cu and 0.48 oz silver/st, with trace gold, though mill heads were lower (1.5% Cu) (Mahoney, 1942a, p. 1). Material in the range of 0.5% Cu to 4% Cu was milled (Snyder, 1919, p. 181).

The mined sulfide ores had pyrite, chalcopyrite, and sphalerite in a gangue of fine-grained garnet and epidote. Lesser amounts of calcite and quartz were contained in the gangue (Snyder, 1919, p. 181) and could be the precious metal host. Galena was noted with the metal sulfides (Innes and Assoc., 1982, p. 11). Residual carbonate ores, mined to their shallow extent early in the life of the mine, contained copper, silver, and gold. Azurite and covellite have been identified in this zone (Russell and Assoc., 1967, p. 8), along with bornite and rare chalcocite (Snyder, 1916, p. 2).

DEVELOPMENT PROBLEMS AND POSSIBILITIES. The initial mining operations encountered several problems. Mining out of a glory hole with a skip is inefficient. The target was **oxidized** ores bearing copper, silver, and gold, in which the silver and gold value reportedly exceeded that of the copper, even with copper grades of 14% to 20% (Mahoney, 1942a, p. 2). An old-style water-jacket smelter was built on the site (some smelter slag remains today), to recover these high-grade, carbonate-rich self-fluxing ores. But the oxide ores played out at a shallow depth of 50 ft to 60 ft down the glory hole. This is understandable, as the material was merely the oxidized top layer of sulfide ores in a skarn. Thus, early on in the operation, the recovery method had to be drastically revamped. Gravity separation was employed, and failed due to the high specific gravity of the epidote-garnet gangue. A "clean" metallic-rich concentrate proved too difficult to obtain, and led to the mine's first shutdown in 1910 or 1915 (Cederstrom, 1946, p. 87; Kirwan, 1975, p. 2; Mahoney, 1942a, p. 2).

Another development problem was water. The mine produces 30,000 to 40,000 gallons of water per day (Mahoney, 1942a, p. 3), with at least some considerable amount of that total coming from the main level from which stoping originated [Fifth level; a "spring" was noted on an old, pre-stope mine map, which was made sometime prior to 1917 (ADMMR files, Middlemarch Copper Company map)]. So, it can be inferred that significant flooding at the upper part of the mine was a continual problem (Cederstrom, 1946, p. 88).

Ore grade was another problem. Essentially a copper sulfide mine after the near-surface oxide ores were exhausted, the site has low copper grades (Wilson, 1918, p. 1; Mahoney, 1942a, p. 4). Higher grades of copper were reported at depth, below the Sixth Level. Kirwan (1976, p. 1) cites an old mine superintendent report and old newspaper accounts with copper grades below the Sixth Level of 4%, "approaching" 7%, and "12% to 14%", numbers which are substantial, and far exceed the average known copper ore grade, developed over the history of mining in the Middle Pass district (1.26% Cu), and also the average grade of all copper ores mined in Cochise County, AZ (1.01% Cu) (Welty and others, 1985, p. 6). It is likely that Kirwan's grades are too high. Snyder's (1916, p. 3, 4) bulk sampling from the Fourth, Fifth, and Sixth Levels showed a composite grade of 1.74% copper, 0.48 oz silver/ton, and trace gold. Snyder's Sixth Level sample assayed 1.98% copper. Mahoney (1942, p. 1, 4) in part substantiates that grades of copper at depth exceed the 1.5% mill head average, but concludes that "ore from the lower levels is of too low grade to warrant the dewatering of the mine". Had Mahoney felt the double-digit copper concentrations were factual, he likely would not have written such a statement.

Mine condition is another consideration in development. In Apr. 1977, after the Middlemarch Mining Co. of Mr. Howard Birchfield took over the mining claims, attempts were made to de-water the 375 ft inclined shaft that provides access to the lower levels of the mine. A report in the Douglas District Ranger's Office archives states that substantial caving of this inclined shaft ensued during dewatering, which ended the effort. Thus, the cost of repairing this shaft (estimated $57,000) or sinking *another* shaft would be added should first hand investigation of deposit grades at depth be desired.

Development potential possibilities are dependent on the overall geologic environment responsible for mineralization. If this environment is only the known late Tertiary rhyolite porphyry dikes and possibly stocks, then development potential is limited to small deposits. Economic possibilities for the area would be enhanced if an undiscovered porphyry environment at depth is present. Breccia pipes, known in Middlemarch Canyon, but not elsewhere in the Dragoons, can be indicative of a concealed copper porphyry environment (Einaudi, and others, 1981). G.A. Russell and Assoc. (1967, p. 6) add some weight to this argument by reporting "intensely altered", mineralized, quartz-and-feldspar porphyry at depth, and "greenish-grey" in color from disseminated pyrite. We know there is substantial copper-sulfide in the immediate area, and the possibility of a copper porphyry *deposit* would far exceed the value of mining skarn deposits from breccia pipes.

Geophysical studies of the site by Homestake Mining Co. (Induced Polarization and Resistivity surveys, Cameron, 1974, p. 4), which had limited resolution, indicated a lower depth of the Middlemarch Mine breccia pipe at "300 ft to 600 ft" below the surface. Mining proved over 70 years ago that the deposit is more than 300 ft deep.), and the absence of copper-porphyry environment evidence in coring (up to 1,700 ft deep) lead to a conclusion that small skarns are all that exist in this area.

Zinc potential, which has never been exploited in the Middlemarch Mine, is another consideration. Kirwan's (1976, p. 1) citations of an old newspaper article reporting 12% zinc grades in the mine is of interest. While it is not believable that the Arizona Middlemarch Copper Co. failed to develop "12% to 14%" copper ores during the era when copper was king in this mining district [era of 1895-1930 (Wilson, 1951, p. 13)], it *is* understandable that zinc may have been ignored. Uses for zinc were discovered late, and no zinc was mined from the Middle Pass district until 1926 (Wilson, 1951, p. 13), a time by which the Middlemarch Mine was inoperative and flooded (Mahoney, 1942a, p. 1).

MINING HISTORY. A former Mine Superintendent, Edward J. Kelley states that the mine began operation in 1895 (Cederstrom, 1946a, p. 87) or 1897 (Mahoney, 1942a, p. 2) as the Middlemarch Copper Company (Mahoney, 1942a, p. 2; ADMMR files, map) at the hands of a Mr. M. M. Gorman [altered in later citations to "O'Gorman" (Kirwan, 1975, p. 2)]; Richard Gird was another of the initial operators (Snyder, 1919, p. 181). They began the glory hole mine on the "Missouri" mining claim, erected the small water-jacket smelter, and began recovery of copper, silver, and gold from the oxidized ores, which were soon exhausted. Their attempts to treat the low-grade sulfide ore, encountered at depth, by gravity concentration methods was a failure. The copper minerals floated, and the heavy epidote-garnet gangue contaminated the concentrate. The Middlemarch Copper Co. apparently continued to mine, even though the recovery process problems had not been worked out. The company's last attempt to make the operation viable consisted of shipping 70 carloads (tonnage not known) of ore to the Douglas, AZ smelter, "for the most part, at a loss" (Snyder, 1919, p.181). They developed the glory hole to a depth of 140 ft from the surface, on an incline of 60° (G.A. Russell and Assoc., 1967, p. 7A); there were small drifts and stopes off this incline, but no maps of them exist. The Fourth Level drift, a crosscut, and the mines longest level excavation, was also done by the original operators, as well as the beginnings of the Fifth, Sixth, and Seventh Levels off a 250-ft-deep, double-compartment inclined shaft collared in the Fourth Level. Essentially no drifting was done on the Sixth Level at that time. Extent of working on the Fifth and Seventh Levels by the Middlemarch Copper Co. is not known. The operation ended certainly by 1915 (Mahoney, 1942a, p. 2), or perhaps as early as 1910 (Cederstrom, 1946a, p. 87).

The Arizona Middlemarch Copper Co. leased the property in 1915, taking over 73 mining claims on 860 acres. This company's contribution was solving the recovery problem and erecting a 125-ton-per-day flotation mill on the property (Snyder, 1919, p. 181). The company deepened the inclined shaft collared on the Fourth Level to its total depth of 375 ft, started drifts at the Eighth and Ninth Levels, and completed drifting on the Fifth, Sixth and

Seventh Levels. Ore blocked out above the Fourth Level, and to some degree between the Fifth and Fourth Levels, was stoped (Mahoney, 1942a, map; ADMMR files, map). The area is now the large "underground lake" that is encountered near the end of the Fourth Level drift, about 400 ft in from the portal. Shrinkage stoping was begun from the Eighth Level, to mine ore on the Sixth Level (Snyder, 1919, p. 182). Mapping of this part of the Middlemarch Mine (Mahoney, 1942a, p. map), demonstrates that the orebody trend shifts some 25° to the north between the Fifth and Sixth Levels.

Ore drawn from the shrinkage stope through chutes was trammed to the inclined shaft, broken on a grizzly to remove boulders, and raised in a one-ton skip to the Fourth Level. Then it was dumped into a bin, and later trammed to the mill, the top of which was level with and just outside the Fourth Level adit portal (Snyder, 1919, p. 182). All these ore transfers are expensive in mining.

Milling flow sheets are detailed in Snyder (1919, p. 182). The flotation concentrates were shipped to the Copper Queen Smelter of Phelps-Dodge in Douglas, AZ (60 mi distant) under a contract. Some analyses of these shipments reveal 13% to 18% copper concentrates with 5 1/3 oz silver to 8 1/5 oz silver per ton (Snyder, 1919, p. 182).

The most significant thing encountered by the Arizona Middlemarch Copper Co. was the base of the deposit. It is faulted off at a depth of 325 ft, or about 60 ft below the Sixth Level. "Aplitic" granite is below the fault (Snyder, 1919, p. 182). This substantiates low-angle faulting in the Middlemarch Canyon, proposed by Gilluly (1956), but does not eliminate the possibility of more mineralization at depth. Rather, this eliminates only the possibility of structurally continuous mineralization.

While flooding hurt the Middlemarch Copper Co. operations, drought became a problem for the Arizona Middlemarch Copper Co. The water table lowered, and the last 150 ft of the inclined shaft may have been sunk simply in search of water. The lack of water put the mill operation into part-time status.

By 1921, the mine was idle and flooded (Mahoney, 1942a, p. 1). Cederstrom (1946a, p. 88) cites the low price of copper at the time, and a "water problem", which for all we know now, could have been *lack* of water.

The property later was owned by Edward J. Kelley, who worked in the mine beginning in 1901, and was later Mine Superintendent, and a Mr. Gilmore, an attorney from Douglas, AZ. Kelley lived just south of Middlemarch Canyon at the time of ownership (Mahoney, 1942a, p. 2). Kelley and Gilmore requested a Bureau of Mines evaluation during WWII (an assessment that sometimes resulted in Bureau of Mines mining subsidies for production of critical war materials). No funding was provided by the Bureau due to the ore grade (Mahoney, 1942a, p. 2).

A hiatus in information about ownership of the mining claims and activity on the property exists for the period between 1946 and 1966. Omega Minerals, Inc. allegedly operated the mine between 1966 and 1972, when they closed it. Their interest in the property continued until 1973 (USDA, Forest Service files, 1980, Douglas, AZ). Likely the production, if any, was on a small scale. Russell and Assoc. (1967) did a consulting report in 1967, which indicated that Bob Barber held the mining claims around the Middlemarch Mine. No transfer of ownership was recorded at that time. Co-Poly Chemical Mining Co., owned by O. H. Smith of Willcox, AZ, held the mine site in 1967. The object was to pump copper-enriched mine flood water from a stope through the Fourth Level adit, and to precipitate metallic copper onto scrap metal, for later stripping and refining. Shallow concrete-block ponds were built (still present in 1993) by the old flotation mill foundations, and others were bulldozed into waste rock accumulations nearby. All ponds were lined with plastic sheeting. The company was sold in May 1967, and no further data are available (ADMMR files, unpub.). There is no evidence that the ponds were ever used for copper recovery.

Kerr-McGee held a lease on the mine area which expired in July 1975. Lease start data is unknown. Their contribution was three core holes on the property, including one at the Middlemarch Mine (Hackman, 1975, p. 1). The core has been dumped (Innes and Assoc., 1982, p. 5), but sections produced from them show that to the east of the Missouri Shaft (glory hole to the surface), the sedimentary strata, including carbonates, extend to a depth of over 600 ft (Cameron, 1974, fig. 1). This in contrast to the fault-granite contact with the Middlemarch ore zone at a depth of just 325 ft, as encountered in the mine.

Mountain States Development Corp. looked at the property in 1975 for a 100 to 500 stpd copper operation, but no record of a lease is known (Hackman, 1975, p. 1). Homestake Mining Co. became involved with the property in the mid-1970's (Cameron, 1974). Homestake dropped their lease option because they were looking for large tonnage deposits, and estimated that the Middlemarch breccia could be no more than 120,000 st under the most favorable of estimates. The Middlemarch Mining Co. (Mr. Howard Birchfield) took over claims about 1975 (Hackman, 1975, p. 1), and tried to de-water the inclined shaft, collared in the Fourth Level. A dossier of Birchfield's activities seen in archives of the Douglas Ranger District documents little mining activity, but many altercations between Birchfield and persons who travelled near the mine or surrounding claims. Birchfield threatened USBM employees in 1980 when they were doing a RARE II resource study of the Dragoons, preventing any sampling and assessment from being completed in Middlemarch Canyon. The man "disappeared" sometime in the middle 1980's.

It is not known what company opened the numerous excavations between the Middlemarch Mine and the Cobre Loma Mine. These were done by 1982 (Innes and Assoc., 1982).

Current (1993) exploration consists of drilling and coring on existing roads and by old mine sites by the Vancouver firms of West Pride Industries Corp., and Toltec Resources Ltd, a division of Prime Equities, Inc. Lloyd Richards of Pearce, AZ owns the mining claims. Work has been underway since about 1990 (Robt. C. Smith, USBM, 1990, written commun.; USDA Forest Service files, Douglas, AZ, 1991; Mining Record, 1992, p. 1).

REMAINING DEPOSIT/ORE. There is a possibility that ore was exhausted, but this seems unlikely, considering all available reports from the mining era. Consider: there is very little waste rock on the property, meaning that selectivity was used in mining or that a low tonnage overall was produced. If Elsing and Heineman's (1936, p. 91) copper production numbers for the Middlemarch Mine are correct (265,000 lb copper), then the mine produced less than 10,000 st of ore. Snyder (1916, p. 4), in examining the existing mine workings for the new Arizona Middlemarch Copper Co. lessees, estimated 23,000 st of proven ore where the large stope between the Fourth and Fifth Levels now lies. At least a few thousand tons had to come from the Middlemarch Copper Co's. glory hole from the surface. Snyder (1916, p. 4) further estimated 41,400 st of probable ore between the Fifth and Sixth Levels. There is no record any ore was removed from this block, though over 100 ft of drifting was completed on the Sixth Level (Mahoney, 1942a, map). An unknown amount of ore was pulled from the elevation of the Sixth Level via the Eighth Level shrinkage stope. Even considering that Elsing and Heineman's (1936, p. 91) total copper output figures for the mine are low by a factor of one-half, there still should be over 40,000 st of the originally delineated ore left in the mine, and much of it high in the mine, between the Fourth and the Sixth Levels. Mahoney (1942a, p. 4) did state, after his examination of the walls of the Fifth-to-Fourth Level stope, that mineralized rock on the stope walls was low grade material. This suggests that Snyder's 1916 estimate of the block (now Fifth Level-to Fourth Level stope) could have been erroneously high by a factor of over two.

TAILINGS AND DUMP. Little dump material exists. It is all concentrated around the old flotation mill foundations. It was not enough to even estimate a tonnage. Smelter slag (from the late 1800's) is in the same locality. It also is of very low tonnage, an amount that was not estimated. Tailings are present, and were mapped and sampled (fig. 14). There apparently was never a dam built for them. Tonnage is about 11,000 st. The material is below the old flotation mill site, and beside the road that runs up the canyon. All could be readily trucked away.

REMAINING EQUIPMENT. There are considerable amounts of materials on the property, mostly at the old Arizona Middlemarch Copper Co. mill foundation and northeast of the 1980's-era shaft, north of the Middlemarch Mine by about 900 ft. Much of the material is debris from dilapidated housing. Some is scrap trucks and trailers, drill steel, and conveyors. The only salvageable equipment might be the old ball mill from the Arizona Middlemarch Copper Co. flotation mill, which has been hauled off to the north, about 900 ft and dumped in a field. Also, a jaw crusher might be saved.

The complete list of equipment, scrap, and materials is as follows:

At the Middlemarch Mine site:

1. Shed, 12 ft by 18 ft, on skids, useable.
2. Trailer, living quarters, on skid; 3 or 4 rooms, useable.

North of the Middlemarch Mine and south of "the Pit":

1. Hoist drums (2), one with electric motor. Likely scrap.
2. Traylor jaw crusher. Jaws 16-in.-wide. Good condition.
3. Drill, skid mounted. Poor condition.
4. Generator, skid mounted. Poor condition.
5. Flatbed trailer for semi., 25-ft-long, poor condition.
6. Steel tank, 6 ft by 6 ft.
7. Water tank, 10 ft high, 8 ft across, has holes in it.
8. Wagon hitches, nearly rotted away. Possible historical interest.

Northwest of DR262, in sec. 12, NW 1/4, SE 1/4, where there is a published "building" symbol on the 7.5 minute topographic map (Cochise Stronghold, 1985, provisional):

1. Flatbed truck, Ford F600, 10,000 lb GVW, late 1950's model, vandalized.
2. Flatbed truck, Ford F350, 8,000 lb GVW, 1959 or 1960 model, vandalized. Has drill steel (100 ft of 3") in bed. Needs tires to tow.
3. Storage tank (fuel?), 20 ft by 6.5 ft, vandalized, scrap.
4. Motor for dryer, badly rusted.
5. Conveyor system, 30 ft, disassembled, poor condition, probably scrap.
6. Grizzly, mechanical, 20-ft-long, badly rusted.

7. Drill steel, 100 ft of 3", and 70 ft of 1 1/4".
8. Gauges, electronic, for humidity, pressure, and electronic control. In all, 30 to 40 in number. All destroyed.
9. Domestic refrigerators (2), stoves (2), water heater, commode, all lying on ground, destroyed.
10. Trailer, plywood, skidder, 10 ft by 25 ft, with some furniture. Roof and one wall are destroyed.
11. Scrap steel (800 to 1,000 lb), of rail, motors, drum, pump, sheet steel, wheel rims, pulleys.
12. Steel building, 23 ft by 20 ft, corrugated steel over wood frame. ***Good condition; needs only minor repairs (hole in siding).*** Inhabited by unknown variety of animal.
13. Storage tank, on ground, twin cylinders each 28-ft-long, 3.5 ft across. Deteriorated finish. Possibly will still hold fluids.
14. PVC, sun-deteriorated, scrap, 1,000 ft.
15. Water tank, vertical cylinder, 15 ft high, 6 ft across. Good condition.
16. Concrete water tank, 10 ft by 15 ft. Possibly useable condition.
17. Ball mill, large (10 ft across), from Middlemarch Mine.

MINE HAZARDS. Minimal. The tailings appear relatively stable, though some stream erosion has cut through the pile. The mine was not producing effluent waters at the time of the Bureau's examination (summer 1992).

Caving of the portal, which probably dates from January 1993, has made rock fall from the portal area a danger consideration, and may increase the depth of flooding inside the Fourth Level adit. That adit was flooded only ankle deep in the summer of 1992.

The inclined shaft accessible through the Fourth Level adit is flooded above the collar and could be fallen into by unaware persons. It is reportedly caved at some depth below the Fourth Level.

The Missouri Shaft (glory hole at the surface, above the Fourth Level adit), is adequately fenced to prevent falling into it.

DR284

Unnamed prospect (fig. 14)

SUMMARY. Little data available; see sample description.

DR285-295

Unnamed adit (fig. 14, and mine map: fig. 17)

SUMMARY. Prospect adit, 400-ft-long, through metasediments/metacarbonates which were altered by granitic intrusive (likely the mineralizing agent in the Middlemarch Canyon occurrences). Important as an indication of metallization between the Middlemarch area and the San Juan and Sorin Camp areas to the west. Skarn and nearby fractures at adit portal carry copper, zinc, and silver.

PRODUCTION AND STATUS. Inactive, production unknown, unlikely.

SIZE AND ORIENTATION OF THE DEPOSIT. Thin skarn (4 ft) trends about N. 40° W.

MINERALOGY, GRADE. Sphalerite enriched. High copper, zinc, and silver.

DEVELOPMENT PROBLEMS AND POSSIBILITIES. Thin zone of undetermined length. No estimates can be made without more structural data.

MINING HISTORY. Unknown. Probably excavated prior to 1921.

REMAINING DEPOSIT/ORE. Unknown. None in this adit, as it *crosscuts* the structure.

TAILINGS AND DUMP. No tailings. Dump size unknown.

REMAINING EQUIPMENT. None noted.

MINE HAZARDS. None noted. None likely.

DR296

Unnamed prospect (fig. 14)

SUMMARY. Skarn exposed in pit. Little data available. See sample description.

DR297

"Christmas" prospect (fig. 14)

SUMMARY. Adit, caved nearly shut. Little data available. See sample description.

PRODUCTION AND STATUS. Inactive. Production:

1905	147 st	Probably by Dragoon Copper Mining and Smelting Co.
1948	100 st	Probably by Giacoma Bros.

Sources: USBM-IFOC files; Keith, 1973, p. 68.

SIZE AND ORIENTATION OF THE DEPOSIT. Unknown; caved when visited by a Bureau geologist in 1980.

MINERALOGY, GRADE. Reported copper carbonates, bornite, chalcopyrite, with minor galena and lead carbonates at contact of Bisbee Group limestone and a porphyry dike (Keith, 1973, p. 68).

DEVELOPMENT PROBLEMS AND POSSIBILITIES. Undetermined. No data. No estimates made.

MINING HISTORY. Uncertain. Production records suggest very limited work. Tunnel and shaft reported (Keith, 1973, p. 68).

REMAINING DEPOSIT/ORE. Unknown.

TAILINGS AND DUMP. Unknown.

REMAINING EQUIPMENT. None noted.

MINE HAZARDS. None noted. None likely.

DR298-299

Noonan Canyon prospect (on pl. 1 only)

SUMMARY. Not in Noonan Canyon, but in a northeast-flowing tributary to Noonan Canyon, Name from ADMMR files.

PRODUCTION AND STATUS. Inactive. Production: none known or likely.

SIZE AND ORIENTATION OF THE DEPOSIT. Unknown.

MINERALOGY, GRADE. All in colluvial material. Sampled colluvium suggest a skarn hosted in marble and an adjoining porphyry. Samples have low metal concentrations.

DEVELOPMENT PROBLEMS AND POSSIBILITIES. Undetermined. Data are too limited.

MINING HISTORY. Uncertain. Working consists of a bulldozer scrape in colluvium and alluvium.

REMAINING DEPOSIT/ORE. Unknown.

TAILINGS AND DUMP. Dump size unknown; at least 100 ft^3 of unconsolidated sediments have been moved.

REMAINING EQUIPMENT. None noted.

MINE HAZARDS. None noted. None likely.

Cochise Stronghold No. 1 prospect. *NO SAMPLES. ABOUT ONE MI SOUTH OF THE NOONAN CANYON PROSPECT, DR298-299.*

SUMMARY. Bulldozer trench in alluvium. Name from ADMMR files, Phoenix, AZ.

PRODUCTION AND STATUS. Inactive. Production: none known or likely.

SIZE AND ORIENTATION OF THE DEPOSIT. Unknown.

MINERALOGY, GRADE. All in alluvium. Barren limestone cobbles. No sample. Rock within 300 ft of the excavation includes limestone bedrock, arkose float, quartz-feldspar dikes in outcrop.

DEVELOPMENT PROBLEMS AND POSSIBILITIES. Undetermined. Development unlikely. Data are limited.

MINING HISTORY. Uncertain. Working consists of a bulldozer scrape in alluvium.

REMAINING DEPOSIT/ORE. Unknown.

TAILINGS AND DUMP. Dump size unknown; bulldozer trench is shallow.

REMAINING EQUIPMENT. None noted.

MINE HAZARDS. None noted. None likely.

DR300-315

Standard Tungsten Mine (fig. 32)

a.k.a. Black Prince Mine (after mining claim group);
Johnnie Boy (after mining claim group);
Johnnie Boy No. 1 barite prospect (after barite occurrence on westernmost claim, DR311-315);
Kreis Mine (after owner of claims in 1950's, John F. Kreis, Warren, AZ).
Head Center (after Ernest Escapule's original claim on the barite locality (DR311-315).

SUMMARY. Staked for barite in the 1930's, but barite located on only one claim (DR311-315). Claims re-located in late 1940's for silver, but no commercial amounts found (Johnson, 1951a, p. 1). Non-commercial grade tungsten as scheelite in two faults through limestone (DR301-305,307-310). Five shafts, up to 30-ft-deep, one short adit, one open trench, one small pit.

PRODUCTION AND STATUS. Inactive. Production:

1932	75 st barite	Hand sorted.
1932	1.5 st WO_3	
1950	1.0 st WO_3.	

SIZE AND ORIENTATION OF THE DEPOSIT. One north-trending fault, with non-commercial grade scheelite along about 400 ft of its strike length (Johnson, 1951a, p. 2; Dale and others, 1960, p. 59). Intersected by a N. 45° E.-trending fault zone (dips SE. 67°) with scheelite along about 400 ft of its strike length (Dale and others, 1960, p. 57, 59).

Barite zone in DR313-314 adit is 18-ft-wide; the zone is at least 40-ft-long on strike. The adit, once 40-ft-long, was backfilled for at least half its length by the late 1950's (Stewart and Pfister, 1960, p. 11)

MINERALOGY, GRADE. Scheelite, coarse-grained, straw-colored, reported in silicated limestone with sparse copper and iron oxides. Scheelite is centered in fault-filling, and is up to 1.5-ft-wide, but only 1 ft in length; assay: 0.37% WO_3 when cut DR304-305 was not sloughed (Johnson, 1951a, p. 1). Molybdenum (0.17%) and zinc (0.6%) with the tungsten too high for Federal Government purchase regulations of the 1950's (Johnson, 1951, p. 1). Highest tungsten grades from USBM sampling in DR308-310 (maximum 0.07% W or 0.94% WO_3, which is about 10% of the cut-off grade for tungsten.

Barite was found only on DR313-314 working; assay of 56.6% $BaSO_4$ (Stewart and Pfister, 1960, p. 11). Elevated barium verified by USBM sampling in the Coronado project.

DEVELOPMENT PROBLEMS AND POSSIBILITIES. Low levels of tungsten. Thin occurrence zones. Alluvial cover prevents mapping of length of the deposit. Size of barite occurrence not determined.

MINING HISTORY. Claim staked by Ernest B. Escapule in 1937(?) as the Head Center for barite (DR313-315 area). Reported post-1937 production cited by Stewart and Pfister (1960,

p. 11) is identical in amount to the 1932 production recorded in USBM-IFOC files. The material was shipped to a "west-coast firm". By 1953 the area was staked as the Johnnie Boy No. 1 claim, owned by John F. Kreis of Warren, AZ, and leased to Standard Tungsten Corp, New York, NY, along with 8 adjoining claims of the Johnnie Boy and Black Prince groups to the west. Kreis had been involved with the property in 1950, and a small amount of WO_3 was produced that year (Stewart and Pfister, 1960, p. 10; USBM-IFOC files). Standard Tungsten was involved in the property until about 1953 (ADMMR files, unpub., 1953, Phoenix, AZ); after that there is no information.

REMAINING DEPOSIT/ORE. None known.

TAILINGS AND DUMP. No tailings. Dumps: see sample descriptions.

REMAINING EQUIPMENT. None noted.

MINE HAZARDS. None noted.

DR316-326

Festerling Mine (fig. 32)
a.k.a. Cora Mine

SUMMARY. Granite intrudes the Black Diamond fault zone where it cuts limestone breccia. Weak skarns explored by about 450 ft of workings, most of them vertical. Probably a small, rich, zinc, copper, lead, silver skarn intersected by DR320-323 workings. Negligible production.

PRODUCTION AND STATUS. Inactive. Production:

1937	10 st
1939	11 st
1940	5 st
1947	2 st
1958	?.

Source: USBM-IFOC files.

SIZE AND ORIENTATION OF THE DEPOSIT. Northwest-trending, northeast-dipping segment of the Black Diamond fault zone exposed for about 800 ft along strike through the property. Mining localization suggests less than 50 ft of strike length has been mineralized in economic concentrations. The shafts workings are open but were not accessed. The adit, which intersects at least one shaft (DR320-323) was gated and locked in late 1989. Access was not obtained. The very small production, compared to the very high grades reported (see below) supports this "very small skarn" conclusion.

MINERALOGY, GRADE. Ten tons of stockpiled material on site in 1958 was assayed by the Arizona Dept. of Mineral Resources, revealing 20% zinc, 1.5% copper, 2% lead, 16 oz silver/st, and no gold (Johnson, 1958a, p. 1).

DEVELOPMENT PROBLEMS AND POSSIBILITIES. Examination in 1958 revealed no ore in sight (Johnson, 1958a, p. 1).

MINING HISTORY. One mining claim staked by Ed Festerling, Bisbee, AZ, in 1937, followed with two more claims in 1948 and 1949. The "glory hole" type shaft (DR320-321) was "old" by 1958, and was measured at 110 ft in depth. It likely has undergone excessive caving of the rapidly decomposing, chloritized granitic at the collar. The adit at the same elevation as this "glory hole" (locked, no access, examination, or sample) was reportedly 135-ft-long, and intersected the inclined, 75-ft-deep shaft (DR322-323) at the face. Also, a 25-ft-deep winze was sunk at the adit/incline intersection. In Apr. 1957, the property was leased to Alejo and Juan Antunez of Tombstone, AZ, and three others, who were sinking a shaft (probably DR326) on weekends in early 1958. No record of production is known from this work; the lease expired in 1959. Data from Johnson (1958a, p.1). There is no other information.

REMAINING DEPOSIT/ORE. None known.

DR327-328

Unnamed prospects (fig. 32, and mine maps: fig. 40)

SUMMARY. Two short adits, one shallow pit on northwest-trending fault zone (Phelps-Dodge, 1979, map) that extends north from the Silver Cloud patent (fig. 32). Minor silication.

PRODUCTION AND STATUS. Inactive. No production from barren prospect DR327; production from adit, pit DR328 unlikely.

SIZE AND ORIENTATION OF THE DEPOSIT. DR327 is negligible; DR328 may have 300 ft of strike length, and over 15 ft of width, but talus cover prevents verification.

MINERALOGY, GRADE. Minor silication. No metal concentrations of interest. Zinc reaches 0.17% in DR328.

DEVELOPMENT PROBLEMS AND POSSIBILITIES. A considerable strike length could be proven for DR328, if additional time was spent at the site, but metal concentrations do not warrant further work.

MINING HISTORY. Unknown.

REMAINING DEPOSIT/ORE. None known.

TAILINGS AND DUMP. No tailings. Dumps are small: see sample descriptions.

REMAINING EQUIPMENT. None.

MINE HAZARDS. None.

DR329-334

Group of unnamed prospect shafts and one adit (fig. 32 and 38)

SUMMARY. Five shafts, up to 200-ft-deep, on the Escapule fault zone. A 25-ft-long adit about 100 ft to the NW. in breccia. Data from Nov. 1989 examination. Samples are a test of metallization in the Escapule fault zone about 2,200 ft NW. of the Escapule Mine. These are the only other prospect excavations on that fault zone.

PRODUCTION AND STATUS. Inactive, production, if any, unknown.

SIZE AND ORIENTATION OF THE DEPOSIT. Size, extent not known; trend is same as the Escapule fault zone as mapped by Phelps-Dodge (1979, map).

MINERALOGY, GRADE. Copper carbonates and oxides noted on dump material. The high-grade samples from the dumps of the adit and two shafts contain 1% Cu and >2% Zn (DR329,331,333). Form of the zinc is unknown. Iron-oxide staining at sites DR329,333 suggests possible sulfide forms of the metals. DR333 also has 1.9 oz Ag/st.

DEVELOPMENT PROBLEMS AND POSSIBILITIES. Zones of undetermined width and strike length. No estimates can be made with this absence of structural data.

MINING HISTORY. Unknown. Probably excavated prior to 1942.

REMAINING DEPOSIT/ORE. None known.

TAILINGS AND DUMP. No tailings. Dump sizes: see sample descriptions.

REMAINING EQUIPMENT. None noted.

MINE HAZARDS. None noted.

DR335-341

Group of unnamed prospect shafts, open cuts and small adit (fig. 32 and 38)

SUMMARY. There is a 6,000-ft-long fault zone, SW. and sub-parallel to the Escapule fault zone, mapped by Phelps-Dodge (1979, map). See fig. 32, 38. Faults intersected by these shafts may be splays of the fault zone sub-parallel to the Escapule fault zone. Two small open cuts, three shafts, and one 25-ft-long adit. The third shaft is 25 ft NW. of shaft DR335-336; the adit is about 50 ft NW. of shaft DR335-336.

PRODUCTION AND STATUS. Inactive, production, if any, unknown.

SIZE AND ORIENTATION OF THE DEPOSIT. At least three NE.-trending fault zones, vertical to steeply SE.-dipping. Thicknesses: 1.5 ft to 4 ft. At least one of the faults pinches out to the north, very close to these workings. The zones are covered to the S. by talus on a steep, south-facing slope. Exposure is very poor.

MINERALOGY, GRADE. Hematite-enriched, silicified faults through limestone. Geochemically anomalous zinc in samples, but in concentrations <1%. Copper concentrations well below 1%. Anomalous gold, usually with elevated arsenic: 0.19 oz Au/st in DR338, a high grade sample of the central fault zone (only 0.025 oz Au/st in place). In the southernmost fault zone, 0.11 oz Au/st, in place DR339; the high-grade dump sample from this zone has 0.077 oz Au/st. Silver usually not present; highest concentration is 1.5 oz Ag/st in sample DR336, the northernmost of the three fault zones.

DEVELOPMENT PROBLEMS AND POSSIBILITIES. Continuity of the three fault zones has not been proven. Some of them could be of very short strike length. These thin faults contain anomalous concentrations of gold, but they are narrow enough to require underground methods of mining. The gold concentrations are significantly less than 1 oz/st, and with the current (1992) $350/oz gold, underground mining costs cannot be supported here. No resource estimates were made due to undetermined extent of structures.

MINING HISTORY. Unknown.

REMAINING DEPOSIT/ORE. None known.

TAILINGS AND DUMP. No tailings. Dump sizes: see sample descriptions.

REMAINING EQUIPMENT. None.

MINE HAZARDS. Minimal. Persons could readily fall down the open shafts (DR335,338), but they are in a very difficult-to-reach locality.

DR343-344

Unnamed prospect adit (see fig. 32 and mine map: fig. 40)

SUMMARY. Small adit; relation to pervasive, northwest-trending fault zones mapped by Phelps-Dodge (1979, map) in the region is unknown.

PRODUCTION AND STATUS. Inactive. Production unlikely.

SIZE AND ORIENTATION OF THE DEPOSIT. Data about structural extent not collected by field geologists during their Nov. 1989 visit to the site

MINERALOGY, GRADE. Gouge in limestone has up to 2.16 oz Ag/st, 0.008 oz Au/st.

DEVELOPMENT PROBLEMS AND POSSIBILITIES. Cannot be determined with data on structural extent. Low metal concentrations in samples, apparent lack of production strongly suggest no resources are present at this prospect.

MINING HISTORY. Unknown.

REMAINING DEPOSIT/ORE. None known.

TAILINGS AND DUMP. No tailings. Dump dimensions unknown.

REMAINING EQUIPMENT. None noted.

MINE HAZARDS. None noted.

DR345-347

Unnamed prospect adits (see fig. 32 and mine map: fig. 40)

SUMMARY. Short adits on skarn at porphyry dike contact. Elevated zinc.

PRODUCTION AND STATUS. Inactive. Production unlikely.

SIZE AND ORIENTATION OF THE DEPOSIT. The skarn is along a near-vertical contact for about 30 ft down dip; strike length is covered by talus.

MINERALOGY, GRADE. Zinc concentrations are >1% Zn. Silver and gold are is low (maximums of 0.5 oz Ag/st; 0.002 oz Au/st). Cadmium is elevated (>0.01%).

DEVELOPMENT PROBLEMS AND POSSIBILITIES. An extended occurrence along strike is possible, but not known; metal concentrations do not warrant further work here.

MINING HISTORY. Unknown.

REMAINING DEPOSIT/ORE. None known.

TAILINGS AND DUMP. No tailings. Dump is negligible in size.

REMAINING EQUIPMENT. None.

MINE HAZARDS. Mine back is bad in lower adit; loose, large pieces of rock. However, the site is isolated, hard to spot up on the hillside from the existing access road into the regions, and requires a steep climb to reach it. Few persons are likely to venture there.

DR348

Unnamed prospect (fig. 32)

SUMMARY. Three shafts, close together (see sample descriptions), intersect southern end of a NE.-trending fracture in limestone breccia.

PRODUCTION AND STATUS. Inactive. Production unlikely.

SIZE AND ORIENTATION OF THE DEPOSIT. The fracture zone is vertical. Talus cover is extensive, but iron-stained outcrop extending roughly on strike and uphill to the north suggest possible strike length extension of about 1,000 ft from the shafts.

MINERALOGY, GRADE. Heavy hematite and limonitic material in the sample, with minor malachite stain was only evidence of mineralization. There was no "high-grade" material on the shaft dumps. Metal concentrations here were the highest in the zone of prospects north from the Silver Cloud patent. Zinc and lead concentration are >1%; copper is 0.33%. Silver and gold are elevated: 0.02 oz Au/st; 2.5 oz Ag/st. Cadmium exceeds 0.01%.

DEVELOPMENT PROBLEMS AND POSSIBILITIES. Lack of time prevented walking out the possible outcrop extension of this zone seen for roughly 1,000 ft uphill and about on strike to the north. The material at the shaft areas did not appear to be mineralized to any great extent. Assay results for zinc, lead, and gold are higher than anticipated. More structural data is needed to assess the possible structural extent away from the shafts.

MINING HISTORY. Unknown.

REMAINING DEPOSIT/ORE. None known.

TAILINGS AND DUMP. No tailings. Dump is negligible in size.

REMAINING EQUIPMENT. None.

MINE HAZARDS. None.

DR350-352

Unnamed prospect north of Silver Cloud patent (fig. 32 and mine map: fig. 39)

SUMMARY. Two adits which were turned into part-time domiciles/camps sometime between the summer of 1988 and mid-Aug. 1989 (Raymond C. Harris, oral commun., 1989). They intersect skarn in limestone and are in same fault trend as the northeasternmost of the Silver Cloud patent faults. The upper adit (DR350-352) has enough domestic materials brought in, that it is essentially a "house", with a sealed door, carpeting, electric lighting throughout (powered by a stack of automobile storage batteries), shelving, a vented stove, a clothes closet (from a converted side drift). The lower adit (no map or samples) is filled with domestic materials and has a sapling-and-plastic bivouac built out from the portal for several feet. The bivouac is in disrepair and filled with household-type debris. A large mirror mounted inside the adit portal blocks the mineralized zone from sampling in this adit.

PRODUCTION AND STATUS. Inactive. No data known. Possibly worked in conjunction with the Silver Cloud patent.

SIZE AND ORIENTATION OF THE DEPOSIT. Upper adit (DR350-352) intersects 1.5-ft to 4-ft-wide fault, brecciated and partially silicated, that extends along strike for at least 120 ft and along the dip slope for at least 30 ft. It was not seen in outcrop above the adit, but only limited time was spent trying to find it. The host is limestone breccia. The lower adit (no map or sample) is on an essentially parallel fault zone to DR350-352, and is a 5-ft-wide zone of fracturing through a limestone breccia. It has no silication. The working exposes this fracture for 34 ft along strike.

MINERALOGY, GRADE. Weak skarn in upper adit. Minor iron-oxide stain in lower adit. Samples from upper adit slightly elevated in zinc (0.6%) and silver (3.3 oz/st, maximum), with geochemically anomalous lead and copper. Low concentrations of gold detected in all samples: maximum is 0.056 oz Au/st (DR351).

DEVELOPMENT PROBLEMS AND POSSIBILITIES. Known concentrations do not encourage further prospecting within the confines of the existing workings.

MINING HISTORY. Uncertain. Perhaps developed with the workings on the Silver Cloud patent (see Silver Cloud patent, this appendix, next page).

REMAINING DEPOSIT/ORE. None known.

TAILINGS AND DUMP. Dump of lower adit is negligible in size; upper adit is about 500 st (based on 9,600 ft^3) that is mostly limestone and not enriched.

REMAINING EQUIPMENT. Extensive quantities of household goods. See "summary", above.

MINE HAZARDS. None.

Silver Cloud patent (*NO SAMPLES*) (fig. 32)

See DR350-352 for workings immediately north of the patent.

SUMMARY. Patent owners did not respond to USBM requests of Nov. 1989 and Mar. 1990 for permission to examine the workings on this patent. Lacking permission to enter this private land, no USBM work could be done here for the Coronado National Forest study. The production history and adjoining geology suggests this was an unsuccessful attempt to find economic precious metals deposition in skarn. One shaft and one adit. It is important to note that the adit, as shown of the Black Diamond Peak 7 1/2 minute topographic quadrangle map, is about 100 ft NW. of the patent boundary (as shown on the land-ownership version of the quadrangle map on file with the Coronado National Forest Supervisor's Office, Tucson, AZ). However, the USBM field examiner in 1992 decided that this adit is actually lower in elevation than shown on the land ownership/topographic map. It appears to the examiner, who was without the aid of surveying equipment, that this adit portal is on the patent, rather than on National Forest land. For that reason, the adit was not examined.

PRODUCTION AND STATUS. Inactive. Last prospected in 1987. Production from USBM-IFOC files:

Year	Tons (st)	Notes
1921	?	20 oz silver and 2 oz gold.
1934	81	
1938	8	
1939	2	
1940	2	
19??	5	
1954	27	
1955	8	
Totals	133.	

SIZE AND ORIENTATION OF THE DEPOSIT. Geologic map of Phelps-Dodge (1979) suggests control by two N. 25° E.-trending faults that are part of a larger, NW.-trending fault zone that extends for 5,000 ft to the north of the patent and has been excavated by several small prospects north of the patent. The two parallel faults, about 150 ft apart, cross the entire width of the patent.

MINERALOGY, GRADE. Unknown. Probably skarn, based on examination of prospects on the northeasternmost of the two faults, outside of the patent boundary.

DEVELOPMENT PROBLEMS AND POSSIBILITIES. Cannot be determined without data.

MINING HISTORY. Uncertain. Mineral survey number 1383. The production table, above, gives best available sketch of mining history. Santa Fe Pacific Mining, Inc., Albuquerque, NM, prospected the site as part of their San Thomas-Silver Cloud project during 1987. One hole was drilled on the patent and three more were drilled on National forest land to the northwest (see fig. 32) (USDA, Forest Service files, 1987, Douglas, AZ). The drill data were not acquired by the USBM for this study.

REMAINING DEPOSIT/ORE. None known.

TAILINGS AND DUMP. Dumps the shaft (on the southeasternmost fault) and around the adit (on the northwesternmost fault zone), seen from higher elevations on National Forest land. Not measured as we had no permission to enter the property.

REMAINING EQUIPMENT. Unknown. The adit has many signs that it is being used as a part-time domicile or camp. There is a motorcycle parked on the dump, and much household debris around. This material has been present since at least mid-Aug. 1989, but the site was devoid of all domestic-type materials when examined by Arizona State employees in the summer of 1988 when they were putting up "hazard-no trespassing" signs at old open mine workings in the region (Raymond C. Harris, oral commun., 1989).

MINE HAZARDS. Unknown. No data. The adit is open. The shaft appears to be covered.

DR355-363

Moonlight Mine (fig. 32 and mine map: fig. 37),
a.k.a.: (Joe) Escapule Mine, after the original miner;
Garnet (after name of part of the mining claim group);
Arizona Group (after name of previously staked claims).

Note: location of Moonlight and Northside mining claims of 1990 is not the same as those by the same name staked in the 1940's. All the claims were expired in Jun. 1992.

SUMMARY. 289-ft-long adit, inclined shaft and two small surface cuts explore skarn near and along limestone-quartzite contact. Down-dip extension at least 160 ft, but skarn is not continuous along strike, nor is it high-grade; minor production.

PRODUCTION AND STATUS. Inactive, claims expired. Produced 60 st from main adit (DR355-359) and 60 st from upper working (DR361-363), stockpiled on site, 1955. Removed years prior to 1989 Bureau examination. In main adit, drifting (last 29 ft at face) and winze sinking (near DR356, 50+ ft of winze) since 1955 would have produced an additional of 100 st, maximum, if all advance was in mineralized rock.

SIZE AND ORIENTATION OF THE DEPOSIT. Skarn, probably faulted, 4-ft-thick, average, and 5-ft-thick, maximum. Trends N. 20° W., dips SW. 40° to 60°. Continues from outcrop (by DR363) down dip to winze in adit (by DR356); winze not entered. Minimum down-dip extension: 160 ft. Maximum strike length 44 ft (DR358 zone). Reserves calculated by Romslo (1955, p. 5) in his 1955 evaluation were 120 st stockpiled (since removed) and a "few tons" at the face of the main adit (since removed during extension of the adit another 29 ft and sinking of the winze nearly for 50+ ft). Skarn is covered NW. of DR359 and SE. of DR363.

MINERALOGY, GRADE. Sphalerite and galena were most important constituents of skarn; pyrite and chalcopyrite were minor, not in recoverable amounts. Gangue is calc-silicates (Bryner, 1955, p. 3). USBM samples from stockpiles (75 lb each, collected and assayed in 1955): upper working (inclined shaft DR361-363) has 5.1% Zn, 1.7% Pb, 0.21% Cu, trace Au, 3.4 oz Ag/st; from main adit, DR355-359, 3.7% Zn, 1.7% Pb, 0.16% Cu, trace Au, 1.9 oz Ag/st (Romslo, 1955, p. 5). A USBM sample from the main adit in 1942 assayed 3.7% Zn, 1.3% Pb, and 0.54% Cu (Voelzel, 1942, p. 18). USBM samples collected in 1989-1992 (DR355-363) verify these concentration ranges of zinc, lead, copper, gold, and silver. Keith's (1973, p. 68) reporting of molybdenum and vanadium at the site is in conflict with Bryner (1955, p. 5).

DEVELOPMENT PROBLEMS AND POSSIBILITIES. Drifting has proven only a discontinuity problem with the skarn. Considering its thinness and, at best, modest grade of zinc, the site is not an economic resource consideration (see "remaining deposit"). The fault zone in which the Moonlight deposit lies extends for 500 ft to the SE. and 4,000 ft to the NW. of the mine (USDA, Forest Service files, 1980, Douglas, AZ). Exploration along that zone would be the most likely place to start. There are other workings along this fault (DR329-334). It was sampled in the road cut, 500 ft SE. of the mine (DR364, fig. 32), but that sample has no elevated metal concentrations.

MINING HISTORY. Staked by Joe M. Escapule, Tucson(?) in 1942. After that time, Escapule built the access road and completed nearly all the mine workings. The main adit had reached a length of 35 ft in 1942, and was extended to 254 ft by early 1955, with four shallow winzes. In Feb. 1955, Escapule leased the property to Charles Lamm of Tucson, who extended the main adit 4 ft, beginning in Jun. 1955. The final 29 ft of this adit and the deep winze near the face were likely also excavated by Lamm. In July 1955, Lamm applied for Federal Government exploration aid for zinc, lead, and copper at the site from the Defense Minerals Exploration Administration. Financial assistance was not granted due to the small size of the exposed deposit, and its obvious discontinuity.

REMAINING DEPOSIT/ORE. Estimated maximum tonnage available: 1) between DR359 and DR360, skarn is 2-ft-thick, average, which is too thin for resource tonnage; 2) between winze immediately W. of DR358 and sloughed-in trench on surface (not sampled), skarn is 95 ft down dip, 45 ft along strike, and 4 ft in width (about 17,100 ft^3 of rock), or 1,400 st; 3) between DR355-357 zone in main adit and DR361-363 inclined shaft, skarn is 40 ft along strike, 160 ft down dip and 4 ft in width (about 25,600 ft^3 of rock), or 2,100 st. Total: 3,500 st of inferred resource material.

TAILINGS AND DUMP. No tailings. Dump of main adit is scattered down the steep, north-facing slope and was not measured. Dump of DR363 is about 400 st (based on 7,200 ft^3 of rock).

REMAINING EQUIPMENT. None. Rail throughout main adit.

MINE HAZARDS. None noted. None likely.

DR365

Unnamed prospect (fig. 32)

SUMMARY. Shaft in Black Diamond fault zone. Low metal concentrations. No resources. See sample description.

DR372-435 and DR436-440

Black Diamond Mine (seven levels: Bagge, First, Dividend, Intermediate, Queen, No. 3 Crosscut, No. 2 Crosscut, plus small drifts and shafts near top of saddle). Black Diamond Copper Mining Co. smelter site is locality DR436-441. See fig. 32, 33 for general location, and mine maps, fig. 34-36, for detail of workings.

SUMMARY. Skarn formed along Black Diamond fault zone. Interconnecting level drifts, shafts, winzes and stopes total about 9,000 ft, 95% of which was driven by Oct. 1901. All driven in search of chalcopyrite/bornite ores with silver. Geochemically anomalous gold present; minor production of the precious metal. Minor zinc production in 1943 and 1944. Almost all ore taken from two of seven stopes; largest stope produced no more than 12,500 st.

PRODUCTION AND STATUS. All on patents, mine inactive since 1971. Patented land and adjoining National Forest land, mostly NW. of mine, was prospected and drilled for gold in 1992. Productions records are in varying degrees of completeness:

Year(s)	Tons (st)	Commodities/amount produced[4] (*"W" EQUALS "DATA WITHHELD"*)
1899 or 1900 to 1933	9,167[1]	Copper, 1,100,000 lb, silver 5,000 oz[2]
1934	0	-
1935	0	-
1936	0	-
1937	460	Copper W lb; lead W lb; silver W oz; gold W oz
1938	31	Copper W lb; silver W oz; gold W oz
1939	3	Copper W lb
1940	0	-
1941	0	-
1942	0	-
1943	55	Copper W lb; zinc W lb; silver W oz; gold W oz
1944	199	Copper W lb; zinc W lb; silver W oz, gold W oz
1945	0	-
1946-51	?	No information
1952	0	-
1953-56	?	No information; probably zero production
1957	118	Copper W lb; silver W oz
1958	0	-
1959-1978	?	Unknown; production unlikely
1979	2,000	Unknown
1980-83	?	Unknown; probably zero production
1984-1991	?	No information
1992	0	-
1993	0	-
Totals	Minimum 12,033 Maximum 37,069[3]	About 1.15 million lb copper, 12,100 oz silver, 15,000 lb zinc, negligible lead and gold

[1] Calculated back from total copper production @ 6% copper ores.
[2] Calculated from $3,000 total silver value @ $0.60/oz silver.
[3] Minimum tonnage from figures in this table; maximum made from measurements of stopes and from 1901 survey and 1906 cross-section maps of the mine (ADMMR files) for stopes that were not accessed in this USBM study, applying a tonnage factor of 12 ft^3/st.
[4] Contained in ores. Sources: USBM-IFOC files (commodity *amounts* withheld); Elsing and Heineman (1936, p. 91); ADMMR files.

SIZE AND ORIENTATION OF THE DEPOSIT. Deposit size was estimated from measurements of stopes, 1901 and 1906-era mapping of stopes that were not accessed, and an untested tonnage factor of 12 ft^3/st. The Black Diamond deposit is mainly a skarn in limestone (SW. part of the mine) oriented N. 40° to 50° W., and dipping SW. 60° to 80°. It is about 15-ft-wide. Occurs for a known 775 ft along the dip slope, but the lower 410 ft is not mineralized in economic amounts (and never was considered to be ore during the entire life of this mine); the upper part of this skarn has been mined extensively and probably mined out (1906 cross-section map shows no distance left between Intermediate and Bulkhead stopes (fig. 35-36). About 41% (15,600 st) of the maximum estimated ore production from Black Diamond Mine has come from this structure on stopes in the Intermediate and Dividend levels (DR385-386). The host rock is Mississippian-age Escabrosa Limestone, according to one source (Keith, 1973, p. 68).

A sub-parallel zone of skarn through the same limestone occurs about 65 ft below the footwall of the DR385-386 zone. This zone is found for at least 550 ft along the dip slope and was mined on the No. 2 and No. 3 Crosscuts (DR376-378), and explored by drifting and a 50+-ft-deep winze on the Dividend level (DR384); the zone is also exposed on the surface (DR372-372, fig. 36). The zone has been mined for about 35% (13,100 st) of the maximum estimated ore production from Black Diamond Mine.

The rhyolite porphyry dikes truncate both of these skarn zones.

Another skarn, massive and magnetite-rich, was drifted on in the Dividend level (fig. 35), where it is about 350 ft wide, and on the Bagge level (about-250 ft-wide). It contains high levels of iron (40% to 50%), but low levels of copper, silver, zinc, and gold. The massive skarn itself was never mined. However, shears and fractures *within* the massive skarn were drifted on in the Bagge (fig. 34) and Dividend levels (DR419-421,389-393,396-399). Where several shears and fractures of varying orientations intersect, small stopes were developed, including the Dog stope (not accessed in this evaluation) and the two stopes above on the Dividend level (DR398-399 and NW. of DR396). These combined stopes were mined for about 24% of the maximum estimated ore production from Black Diamond Mine, with the largest yielding no more than 4,900 st. The top of the magnetite-rich skarn crops out 40 ft above the No. 2 Crosscut portal, and it is on the Bagge level sill, indicating a minimum height of 480 ft. As noted above, it is 250-ft- to 350-ft-wide (NE. to SW.), and it exposed for 800 ft in the NW. to SE. direction. The magnetite-rich skarn was not as favorable an ore host as the much smaller skarns confined to fault zones in limestone in the SW. part of the mine. Metallization in these smaller skarns confined in fault zones through limestone may post-date emplacement of the massive, magnetite-rich skarn.

A fourth skarn was intersected in a limestone host at the bottom of a 293-ft-deep shaft sunk immediately outside the Bagge level portal. Its structural orientation is not known, but can be postulated as paralleling the limestone-hosted zones in the SW. part of the mine (Intermediate/Bulkhead stopes and No. 2/No. 3 Crosscuts). It was not mined, but high grades of copper were reported from the shaft (Mattox and Mattox, 1938).

Smelter slag at the old smelter site, 1.5 mi east of the mine (DR436-440, pl. 1) is low tonnage and low grade material. There are about 9,000 st of slag on the site (DR437,439-441) with a maximum of 0.65% Cu (in the largest lobe of the slag). Two of the 4 slag samples exceed 1% in Zn. Silver does not reach 1 oz/st. The assays indicate an efficient smelting job by the early 1900's operators. Smelters of this generation produced slags commonly with 2% to 3% copper (Canty and Greeley, 1987, p. 192). The unprocessed ore on the site, sample locality DR438 (only about 130 st) contains more than 1% copper and zinc, and 5 oz silver/st; also 0.013 oz gold/st. The tonnage of unprocessed ore is too small for economic considerations by itself.

MINERALOGY, GRADE. Copper occurs as chalcopyrite and bornite in both fractures within the massive magnetite-rich skarn and in narrower skarns in fractures in limestone; copper carbonates and oxides are also present, as are pyrite, sphalerite, and galena (Cederstrom, 1946a, p. 87; Keith, 1973, p. 68). Silver was recovered from the sulfide ores; argentite is the only silver mineral identified (Keith, 1973, p. 68). Grades were reported as better than 6% copper, 10 oz. Ag/st, and $1.40 Au/st (Stevens, 1911, p. 428). The USBM sample with the highest gold concentration is 0.8 oz/st (from the Bulkhead stope). Gangue is specular hematite and magnetite and 38% silica (Stevens, 1911, p. 428).

In 1936, when old stopes were being selectively developed for new ores, grades of 8.20% Cu and 4.20 oz Ag/st were reported in a "smaller" stope, and 16.84% Cu with 23.06 oz Ag/st in a "larger" stope (Mattox, 1936, p. 2). These ores represent production from 1937 to 1939.

The massive magnetite-rich skarn (which also contains considerable amounts of hematite) contains enough iron that it was examined in previous years as a possible iron resource. Reported assays are 40% to 50% Fe (ADMMR files, 1965; Harrer, 1964, p. 24).

Smelter slag: see "deposit size and orientation".

DEVELOPMENT PROBLEMS AND POSSIBILITIES. Acquiring drill data and assays from Cordyne Corp., Exxon Minerals, and Manhattan Minerals would be the most economical way to gather more information about the deposit perimeter at depth. Based on USBM field evaluation, the following are noted. First, the two skarns in fractures through limestone, which have provided most of the mines cumulative production, do not continue northwest of the mine workings; they pinch out at the surface in the NW. direction and carry low metal concentrations there. They reportedly are not enriched at depth below the Bagge level, based on data reported from a 300 ft winze in the Bagge level (Mattox and Mattox, 1938). They have been nearly mined through between the Intermediate stope and Bulkhead stope and mined through from the No. 2 Crosscut and No. 3 Crosscut. Stope perimeters (NW.) may still have minable material, but tonnages will not be large. Stope perimeters to the SE. show the porphyry dike has cut off the ore zone. The entire mine to date has produced a maximum of about 37,000 st of ore.

The intersections of fractures within massive magnetite-rich skarn, which were stoped on the Dividend level, in the Dog stope, and drifted on in the First level and Queen drifts and shaft, are very small deposits (4,900 st, maximum, est. of Dog stope), and the assays from samples collected by the USBM are low in metals. These structures were likely mined out and exploring for more does not seem warranted.

The porphyry dikes are late phase structures and are not metallized. Areas with fine pyrite contain essentially no gold.

The skarn intersected in the bottom of a 293-ft-deep shaft outside the Bagge level portal is interesting due to the reported metal content of 32% copper in bornite (Mattox and Mattox, 1938, p. 2). Drilling in the 1979-1992 period by Cordyne, Exxon, or Manhattan Minerals may have intersected this zone, but such data are not known to the USBM. The shaft area remains a permissive exploration target. The skarn in that shaft apparently is in limestone, and may be the occurrence type like the most productive skarns in the mine (Intermediate, Bulkhead, No. 3 and No. 2 Crosscuts). Even if an ore body could be discovered on the skarn area below the Bagge level, it could be small: 9,000 st to 12,000 st, if on the scale of the Bulkhead/Big stope part of the deposit or the No. 2 Crosscut part of the deposit. The still smaller size of metallized fracture zones within the massive, magnetite-rich skarn is possibly due to pre-ore deposition silicification of massive skarn and corresponding greater tightness of the rock.

Precious metals are not a consideration in the Black Diamond Mine itself. Though the mine was started for silver, initially, at the turn of the century, this silver was most likely found as secondary enrichment in some of the small surface prospects and short adits still visible on the property today (1992) (see fig. 36). Silver recovery from the underground sulfide ores took place, but silver was, at best, a byproduct in those ores. Gold concentrations are too low for economic consideration with the sulfide ores, though it is possible to recover some if enough tonnage is smelted. The gold exploration target of Cordyne Corp., and later Manhattan Minerals Corp., is reportedly on the NW. side of the saddle, away from all the mine workings, on the Procrastination patent and adjoining National Forest land. Limited sampling by USBM did not detect gold in the exploration road cut exposure of the Black Diamond fault zone (fig. 33). The road was since reclaimed, burying rock exposures. Drill data of Manhattan Minerals may show different results; those data were not available to the USBM for this assessment.

MINING HISTORY. The Black Diamond Mining Copper Co. was organized in 1898, and capitalized by selling $2,000,000 in stock and bonds. There was an office in Warren, OH and Pearce, AZ. Thirty-five claims were staked. In June 1900, the NW.-trending line of three patents was surveyed (M.S. 1437), including England (where Bagge level was portalled), Black Diamond (where most of the workings were excavated and where essentially all of the ores were mined), and the Procrastination (the northwesternmost patent, no workings). The Hobart patent was surveyed in during April, 1901; it adjoins the NE. side of the Black Diamond patent, and contains some of the mine workings (fig. 33).

When mining began is uncertain, but was most likely in 1899 or 1900. By Oct. 1901, over 95% of the mine workings existing today (1992) were completed (ADMMR files, 1901 survey map). In 1902, a smelter was built 1.5 mi east of the mine (DR436-440, pl. 1). Ores were hauled this distance to the smelter by a 600 stpd capacity Leschen aerial tram down an 800 ft drop. The smelter was a 44-in. by 120 in. Allis-Chalmers rectangular water-jacket blast-furnace with a 38-in. auxiliary cupola and a 24-ft. by 36-ft circular roaster. It produced 65% copper matte with 150 oz to 300 oz silver/st with minor gold values (Stevens, 1911, p. 428-429). The smelter ran at full capacity in 1903 (Engineering and Mining Journal, 1903).

By 1903, a 7-mi-long, 4-in.-diameter water pipeline had been installed along with a pumping plant capable of raising 100,000 gpd against a head of 804 ft over 6 mi. The water had to be pumped from Pearce, AZ. At the mine, a 350,000 gal. storage reservoir was built (Stevens, 1911, p. 428; Engineering and Mining Journal, 1903); the old dam built of colluvium several tens of ft below the Bagge level portal in the drainage may be the remnants of this reservoir.

The Black Diamond Copper Mining Co. underwent financial difficulties and management was changed. After a hiatus of unknown length (possibly just 1904), the work resumed at the mine and the smelter was blown in during 1906. But by 1907, it was blown out again, with a lack of sufficient ore cited as the reason. A reported $216,000 worth of matte was shipped from 1903 to 1905. In 1905, the mine crew was at a force of 100; the smelter crew: 50 (Boulter, 1940, p. 2). A significant infrastructure had been put in place, including two Morris-Fairbanks petroleum-powered steam compressors, capable of operating 15 drills, an air storage tank, a blacksmith shop, small warehouse, and powder cave, a 20-room hotel, store, schoolhouse, and many dwellings. The mine was idle from sometime in 1907 through at least 1911 (Stevens, 1911, p. 429; Mattox and Mattox, 1938, p. 2). A hiatus of information exists for the period of 1908-1912. In 1913, the mine was examined for J. G. Hearne, president of the company. A rough estimate of smeltable ore was made, but no assaying was done. The report was sent to the company office in Wheeling, WV, but there is no record of any mining done as a result (Wilking, 1913, p. 1). Another information hiatus covers 1914 to 1933. There was no production of ore in 1934-1936 (USBM-IFOC files).

The Mattox's were operating the mine as lessees in 1936 (Adam Dodd, Pearce, AZ, owner) and began development work in two of the original mine stopes (Mattox, 1936, p. 2). Shipment in 1937 of 460 st of ore from the old stopes (exactly *which* ones is unknown) coincided with the jump in copper price that signalled the end of a severe depression in the copper industry (USBM-IFOC files; Canty and Greeley, 1987, p. 196). Just 34 st were produced in 1938 and 1939, and by June 1939, the property was idle, stripped of equipment, and the lease about to terminate. Adam Dodd was 88 years old and put the mine up for sale (USBM-IFOC files; Dodd, 1939, p. 2). Satero Lopez of Pearce, AZ, was the operator (probably lessee) later in 1939, but no production resulted (USBM-IFOC files).

By 1940, Mrs. Ethel Boulter of Phoenix, AZ, owned the mine, by inheritance. It was for sale, but remained in Boulter ownership until at least 1947. E. A. Pennington of Pearce, AZ, operated the mine in 1943 and 1944, producing 254 st of ore that were shipped to an El Paso, TX copper smelter (Boulter, 1940, p. 3; Boulter, 1947, p. 2; USBM-IFOC files). The mine was idle in 1945 and 1952; there is no information for 1946-1951 or 1953. In 1954, Arizona Materials and Service company was collecting samples from the mine for mill tests; a sink-float heavy media separation plant was being considered to recover manganese and sell it to the Federal Government (Johnson, 1954, p. 1-3) during the time of manganese premiums.

Charles Phillips and others, of Yuma, AZ, controlled the estate-owned mine starting about 1952, and running to at least 1990. The mine was leased to Sam Western and George Peverill of Dragoon, AZ. in 1957; 118 st were produced then and the mine was idle the next year, 1958. Utah Construction Co investigated the deposit in 1959. Western and Peverill sub-leased the mine to G. & H. Metals, Fresno, CA sometime between 1963 and 1965 (the sub-lease was dropped); Colorado Fuel and Iron was also examining the property about that time. Fred Murphy declared he was the mine operator in July 1979, but there is no record of production. Delthe Resources Corp., N. Quincey, MA, sampled the smelter slag (DR437,439-440) in mid-1979, but obtained low metal concentrations and lost interest. Cordyne Corp. of America (CEMA Div., Pearce, AZ, part of Cordyne Corp., Portland, OR) became involved with the property later in 1979, and had stockpiled 2,000 st of ore from an upper level (probably pulled ore from an existing stope) by Dec. 1979. Planned was a 150 stpd flotation operation for zinc and copper. Cordyne was drilling from about Apr. to Nov. 1980 for gold and silver; planned were both open pitting and more underground mining in the Black Diamond Mine (presumably for copper and zinc). The mine was on standby status as of Apr. 1982, and all equipment was removed by May 1983. Exxon Minerals Co. drilled a 1,000-ft-deep hole in Oct. 1983 (ADMMR files; USDA, Forest Service files, 1979, Douglas, AZ). Manhattan Minerals Corp., Vancouver, B.C., drilled the property in 1992 with eleven holes, searching for gold (USDA, Forest Service files, Douglas, AZ). None of these drill data were acquired for the USBM evaluation.

REMAINING DEPOSIT/ORE. No in-place minable material was noted, though not all stopes were accessed. Old maps and cross-sections suggest that there is not enough distance between the Intermediate and Bulkhead stopes to continue mining upward. See "development possibilities".

TAILINGS AND DUMP. No tailings. None of the dumps are rich in sulfide minerals. Dumps (from largest to smallest):

Sample	Working	Size (ft^3)	Tons (st)	Notes
DR404	Dividend	426,075	20,000	1% Zn, 0.6% Cu, 1.7 oz Ag; used 19 ft^3/st tonnage factor.
DR379	No. 3	30,240	2,000	1.6% Zn, 0.9% Cu, 4.5 oz Ag; used 19 ft^3/st tonnage factor.
DR434	Bagge	21,575	1,000	1.9% Zn, 0.5% Cu, 1.8 oz Ag; used 17 ft^3/st tonnage factor.
DR375	No. 2	7,056	400	0.6% Zn, 0.4% Cu, 1.4 oz Ag; used 20 ft^3/st tonnage factor.
DR435	Stockpile	220	10	0.9% Zn, >1% Cu, 2.4 oz Ag; used 17 ft^3/st tonnage factor.
DR383	(Bagge) prospect	negligible	-	-
DR405	prospect	negligible	-	-
n/a	Queen	-	-	Graded into exploration road.
DR380	prospect	-	-	do.
DR372	prospect	negligible	-	-

Smelter site:

DR436-437; DR439-440	slag	138,800	9,000 st	(@ 16 ft^3/st)
DR438	unprocessed	1,600	100 st	(@ 17 ft^3/st)

REMAINING EQUIPMENT. None. Rail ties are in the Bagge level; scrap rail has been pulled and piled up in several crosscut drifts.

MINE HAZARDS. Many loose, heavy pieces of porphyry dike were straining the lagging at the Bagge level portal when the site was evaluated in Jun. 1992. By late Jan. 1993, this portal had collapsed. A moderate danger exists at the Dividend level portal for the same reason. Persons trying to enter the No. 2 Crosscut could fall 100 ft immediately inside the portal. The area is not blockaded or marked in any way. A fall of 30- to 50-ft is possible in the Big stope, Dividend level, and there is much loose rock there where a crosscut was driven into the stope from the main Dividend drifting. Several winzes could be easily walked across or into at the Dividend level stope above Dog stope (DR397-399), though most are securely boarded over at this time (1992). Exploration of the stope above the First level could get someone into danger. Dynamite was in the Bagge level in Jun. 1992 (see map DR406-435) in one locality. That level will likely flood again now that the portal has caved.

DR442-448

Unnamed prospects (pl. 1)

SUMMARY. One northern shaft (DR443), and a group of 4 shafts (DR444-446) about 650 ft to the south. One adit about 400 ft south of DR444-446 group of shafts. Quartz and calcite veins in at least some of the workings. Examined in Nov. 1989.

PRODUCTION AND STATUS. Inactive. Production unknown.

SIZE AND ORIENTATION OF THE DEPOSIT. Extent of the veining unknown.

MINERALOGY, GRADE. Limestone with quartz and calcite veining at many of the sites (some sites have had no mineralogy recorded by field geologists). Sample DR444 exceeds 5.8 oz silver/st, and has 1.7% zinc and 0.018 oz gold/st. It is iron-oxide-stained limestone. Sample DR447 has elevated gold content (0.11 oz/st), elevated silver (>5.8 oz/st), and zinc exceeding 2%; it's mineralogy is not known.

DEVELOPMENT PROBLEMS AND POSSIBILITIES. Cannot be determined with available data. Size, extent of structures unknown. The gold concentration in sample DR447 is interesting, though subeconomic for thin structures that must be mined by underground methods.

MINING HISTORY. Unknown.

REMAINING DEPOSIT/ORE. Cannot be determined with available data.

TAILINGS AND DUMP. Dump sizes in sample descriptions.

REMAINING EQUIPMENT. None reported.

MINE HAZARDS. None reported.

DR449-460

Gordon Spring prospects (fig. 50)

SUMMARY. Seven shallow shafts and two pits intersect contact-metamorphosed carbonate and quartzite (or silicified limestone) strata a short distance above a contact with granite intrusive (probably the Stronghold batholith).

PRODUCTION AND STATUS. Inactive. Production unknown, unlikely.

SIZE AND ORIENTATION OF THE DEPOSIT. Field notes recorded by Bureau geologists in 1980 and 1989 indicate workings on bedding planes and/or areas of metamorphism. No dimensions can be assigned with available data.

MINERALOGY, GRADE. Limestone, silicified limestone (or quartzite), marble, with minor copper carbonates, limonitic material, some hematite staining. Sample DR459, at the granite contact, has elevated zinc (>3%), lead (>1%), and silver 4.1 oz Ag/st). Another of the most intensely metamorphosed samples, DR457, contains elevated zinc (>1%), lead (0.39%), and molybdenum (0.02%).

DEVELOPMENT PROBLEMS AND POSSIBILITIES. Metal concentrations appear to be a phenomenon of contact metamorphism with an acidic intrusive. No resources are estimated or anticipated at this site.

MINING HISTORY. Unknown.

REMAINING DEPOSIT/ORE. Apparently none.

TAILINGS AND DUMP. Dump sizes, where available, in sample descriptions.

REMAINING EQUIPMENT. None reported.

MINE HAZARDS. None reported.

DR461-477

Sala Ranch No. 1 and No. 2 prospects, and nearby unnamed prospects to the east (pl. 1 and fig. 51)

SUMMARY. Two short adits, four pits, and one shaft intersect faults in granite, and sometimes contact-metamorphic zones between the granite and carbonates and/or quartzite. Outcrop of granite intrusive here is probably the Stronghold batholith.

PRODUCTION AND STATUS. Inactive. Production unknown, unlikely.

SIZE AND ORIENTATION OF THE DEPOSIT. Metamorphic and igneous contacts and faults of varying orientations. Field notes recorded by Bureau geologists in 1980 and 1989. No dimensions can be assigned with available data.

MINERALOGY, GRADE. No elevated metal concentrations encountered in the samples from this area.

DEVELOPMENT PROBLEMS AND POSSIBILITIES. No development possibilities foreseen.

MINING HISTORY. Unknown.

REMAINING DEPOSIT/ORE. Apparently none.

TAILINGS AND DUMP. No data on dumps.

REMAINING EQUIPMENT. None reported.

MINE HAZARDS. None reported.

APPENDIX E.

BASIC PARAMETERS OF PREVAL

The composite valuation of a mineral property characterized through the PREVAL software package is expressed as *net present value* (NPV), an analysis equivalent to present worth of cash-flow minus the present worth of after-tax investment (Smith, 1992, p. 21). Taxes factored into the NPV have been standardized for approximation purposes, but it should be recognized that true tax situations for mining properties will vary largely. Each property is considered individually, as a corporate entity, for tax purposes. The Alternative Minimum Tax rate of 20% is applied to all properties by the PREVAL program. Other parameters used to determine the NPV include: state tax rate of 5%, severance tax rate of 2%, property tax rate of 1.1% (based on capital costs), net proceeds tax rate of 2% of gross profits, royalty rate of 6% of net smelter return, depreciation by the Units of Production method, and a 5 year amortization period. Depletion rates of 15% or 22% are applied based on production. In addition, NPV is calculated based on 60% debt of total capital costs, a loan interest rate of 10%, and a loan period of 5 years (Smith, 1992, p. 21-22).

Costs

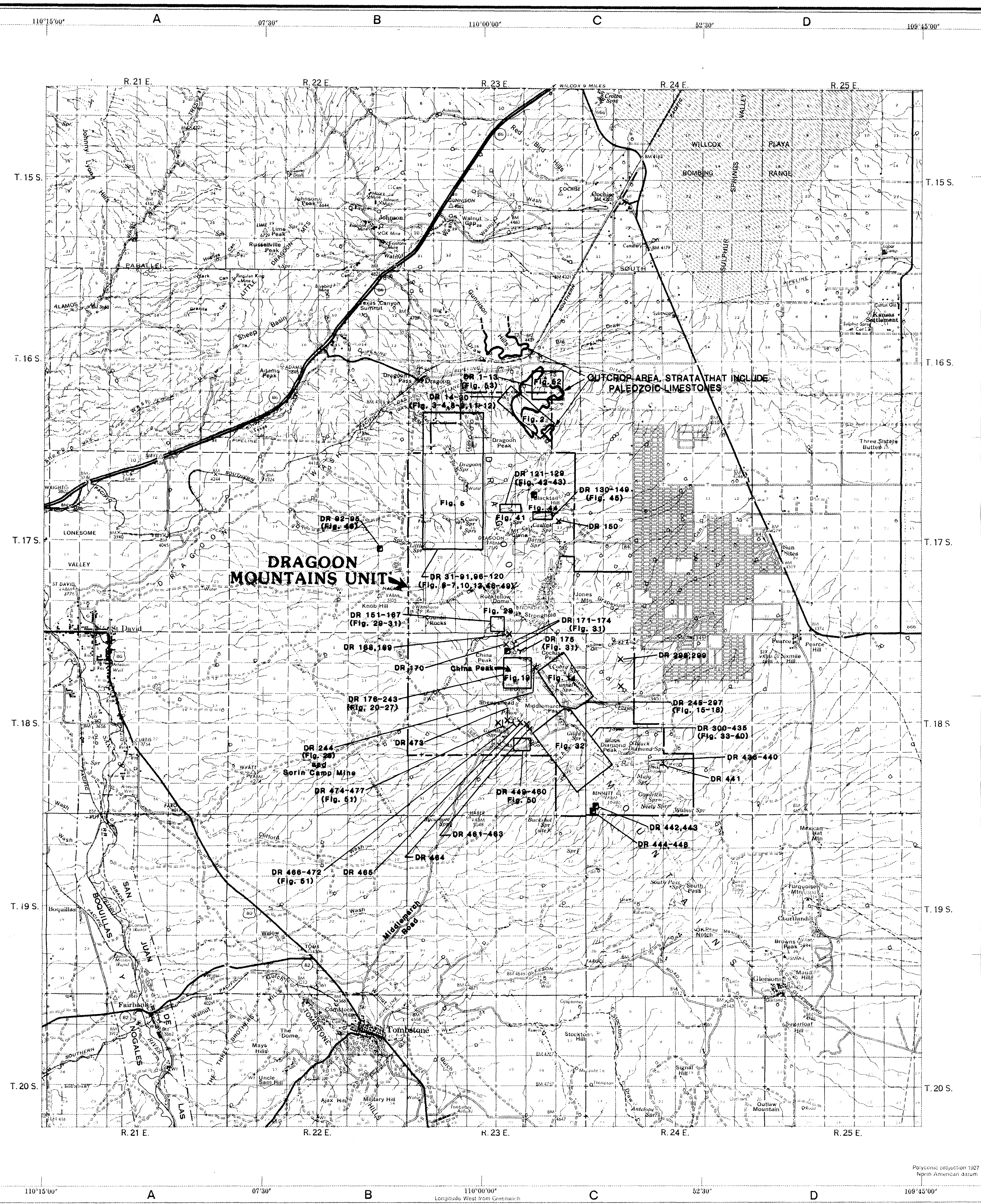
PREVAL cost categories highlighted in this report include mine capital and operating costs, mill capital and operating costs, concentrate transportation charges (truck and rail), and smelter and refinery charges. Exploration costs are partially accounted for in mine capital costs. Acquisition costs are addressed partly as the royalty rate. Salvage value of mine and mill equipment is factored as zero to allow for reclamation costs. Costs are in *average* 1990 $US (Smith, 1992, p. 13, 20, 21).

<u>Operation methods, mine life, material balances, prices</u>

The PREVAL program determines optimum mine and mill methods, production and milling rates, and mine life, based on the following factors that are supplied by the PREVAL user: deposit orientation, tonnage, grade, type and number of commodities to be recovered, overburden, relative ore and wallrock strengths, and distance to smelters/refineries. The PREVAL program calculates material balances and the recoverable part of a deposit. Mining dilutions and recoveries applied by the PREVAL program to Dragoon Mountains properties are: 90% recovery and 10% dilution for shrinkage stope mining methods and vertical crater retreat methods; 85% recovery and 5% dilution for cut-and-fill mining method; 85% recovery and 15% dilution for sub-level stoping method. Mill recoveries used in the one-or-two-product flotation mills applied to Dragoon Mountains properties are 91% of the copper, 90% of the zinc, and 80% of the silver. Concentrate grades are 28% Cu and 58% Zn. Beneficiation is on-site and all smelting/refining is off-site. Transportation of the zinc concentrates is to Bartlesville, OK; copper concentrates are sent to San Manuel, AZ. Commodity prices are entered by the PREVAL user to reflect market fluctuations. The early March 1993 prices of copper and zinc were used in PREVAL calculations for this report (copper: $1/lb; zinc: $0.48/lb; silver: $3.50/oz).

U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF MINES

OPEN FILE REPORT
MLA 30-93
PLATE 1



EXPLANATION

DR 1-13 AREA OF DETAILED INSET MAP--Showing mine workings and sample localities, showing range of sample number(s)

MINE WORKINGS--Showing sample number(s)

DR 473 Pit

DR 442,443 Shaft

DR 474-477 Adit

DR 244 Inaccessible adit

Figure numbers in parenthesis indicate detailed mine maps, and other detailed illustrations/photos.

National Forest Boundary
State Boundary Line
County Boundary Line
Reservation Boundary Line
Interstate Highway
U.S. Highway
State Highway
Forest Route
Forest Trail
Paved Road
All Weather Road
Dirt Road
Primitive Road
Trail
Railroad
Power Transmission Line

District Ranger Station
Forest Service Station
Permanent Lookout Station
Permanent Lookout and Horizontal Control Station
Horizontal Control Station
Boundary Monument
Located or Landmark Object
Tank
Windmill
Mine, Quarry or Gravel Pit
Church
School
House, Cabin or other Building
Recreation Site
Recreation Site other than Forest Service
Point of Interest
Stock Tank
Live Stream
Intermittent Stream

Forest Supervisors Headquarters, Tucson, Arizona

District Ranger Station, Douglas, Arizona

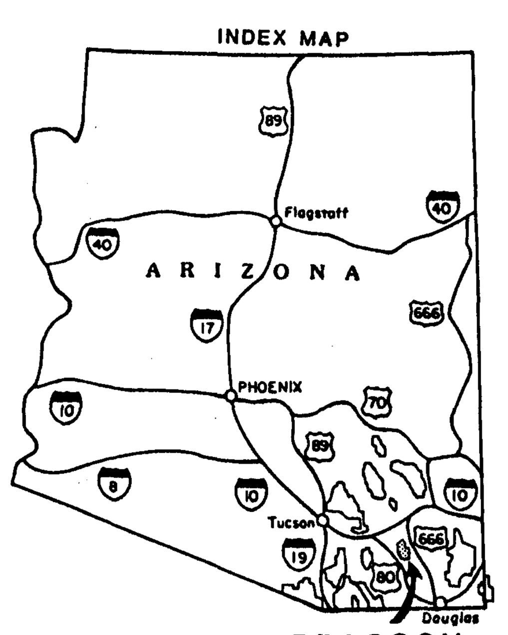
Note: All Forest route numbers shown on this map are prefixed by "5" on official records dated 1975

TOWNSHIP AND SECTION LINE CLASSIFICATION

Surveyed, location reliable
Surveyed, location unreliable
Unsurveyed, protraction by B.L.M.

SCALE 1:126,720

1 0 1 2 3 4 5 6 mi



DRAGOON MOUNTAINS UNIT

Base map compiled and drafted at Regional Office, Albuquerque, New Mexico from U.S. Forest Service Planimeter maps. Revised 1975.

Field work completed in 1980 by T.J. Kreidler and J.R. Thompson; in 1989-1991 by R.C. Smith, R.C. Harris, J.A. Dupree, and D.K. Marjaniemi; and in 1992 by R.C. Armstrong and M.L. Chatman.

SAMPLE LOCALITY MAP OF THE DRAGOON MOUNTAINS UNIT, CORONADO NATIONAL FOREST, COCHISE COUNTY, ARIZONA

BY

MARK L. CHATMAN, U.S. BUREAU OF MINES

1993

FIG. 20

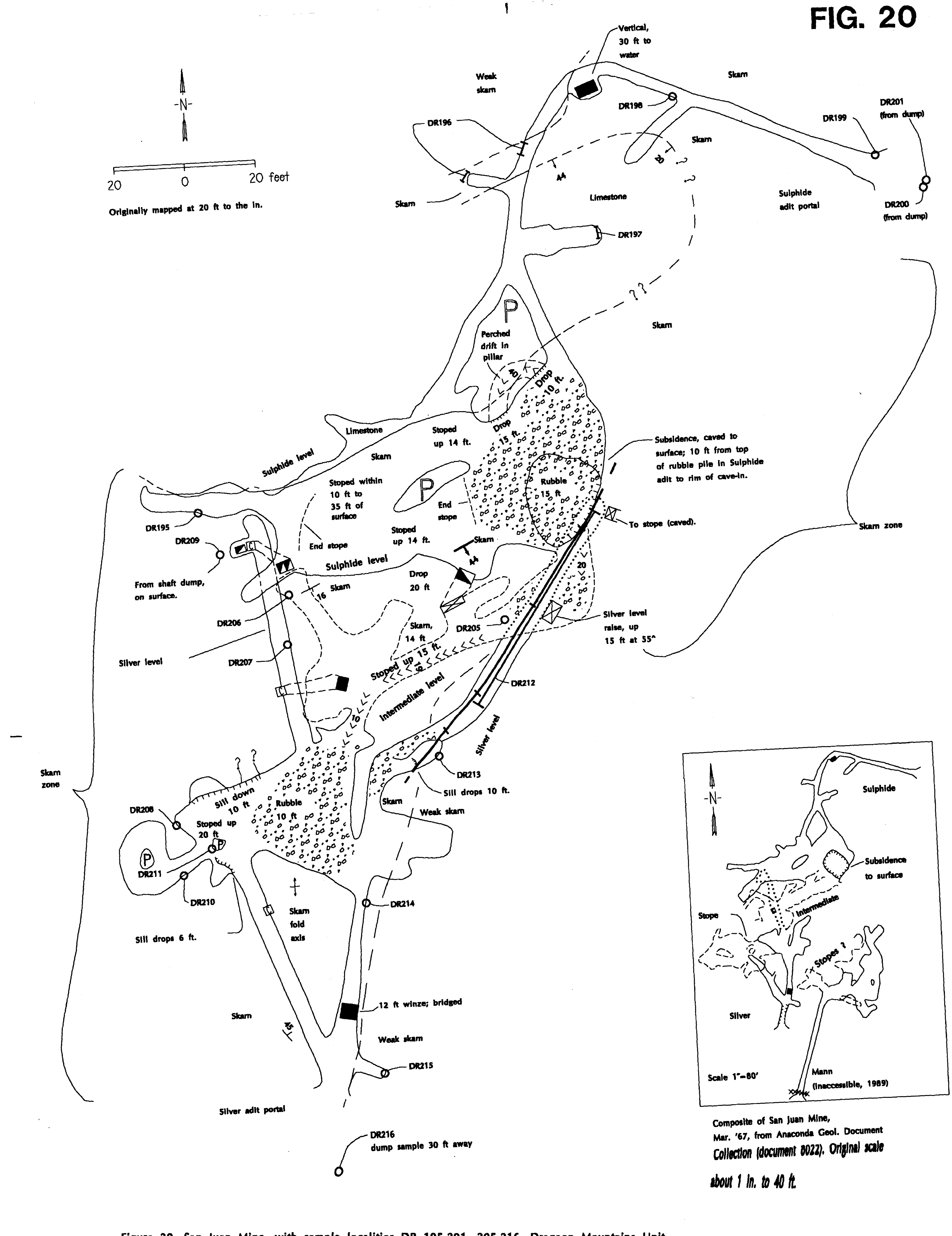


Figure 20.–San Juan Mine, with sample localities DR 195-201, 205-216, Dragoon Mountains Unit.

FIG. 29

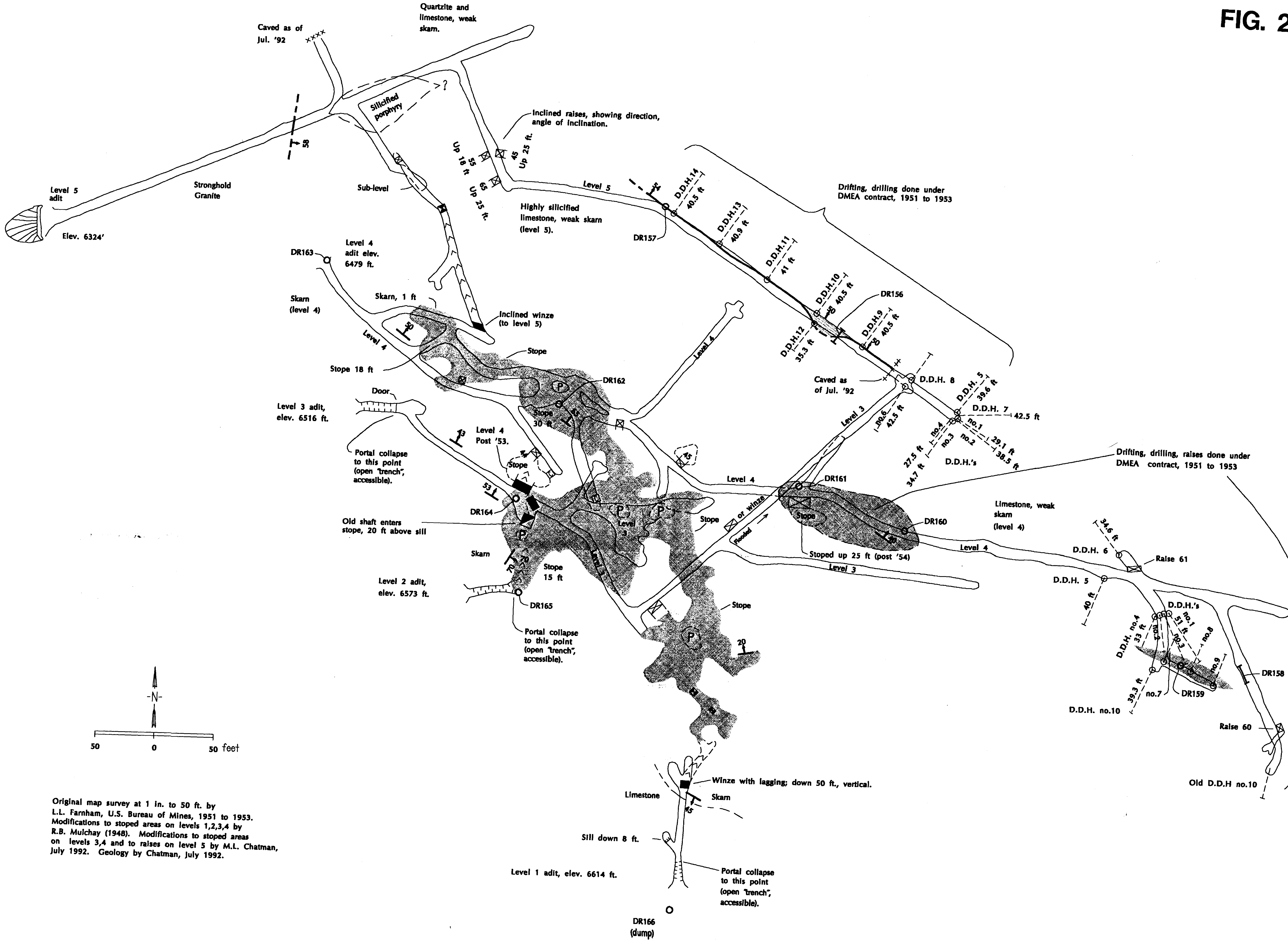


Figure 29.–Abril Mine, with sample localities DR 156-166, Dragoon Mountains Unit.